FPD-Link Ⅲ Serializer Board
FPO-953-F
(Board model number NV022-D)
Hardware Specification

Rev.1.0

NetVision Co., Ltd.

Update History

Revision	Date	Note	
1.0	2020/05/18	New file (Equivalent to Japanese version 1)	H. Suzuki

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1. Overview

This document is the hardware specification of FPO-953-F (FPD-Link III serializer board). This board is equipped with TI company's Serializer DS90UB953, and is for converting the video signal input from MIPI to FPD-Link III signal. This board has a system of FPD-Link III output and a connector for connecting to our SVO-MIPI series (SVO-03-MIPI etc.) board. It can be applied to the emulation of the FPD-Link III camera combined with the SVO board.

Block Diagram

The block diagram of this board is shown in the figure above. For FPO-953-F, the FPD-Link III output is connected to the FAKRA connector, so the HSD connector is not mounted and cannot be used. The MIPI signal input connector (CN3) is intend to be connected to our video output board SVO-MIPI series and can be directly connected and used. As an option, this board has the pattern that can implement the PIC microcomputer for I2C slave emulation. The board power is supplied from the video output board such as SVO-MIPI through the connector CN3. (It does not support PoC.)

The figure below shows the connection image between this board and SVO-MIPI. Since the screw hole positions are common to both boards, they can be fixed with spacers

Connection Image

FPD-Link III
Output
(FAKRA)

HDMI Connector

NV022-D

SVO-MIPI

FPD-Link III
Output
(HSD)

Inter-board
Connector
for Frame Sync.

USB3.0 Connector

Reset Switch

DIP Switch
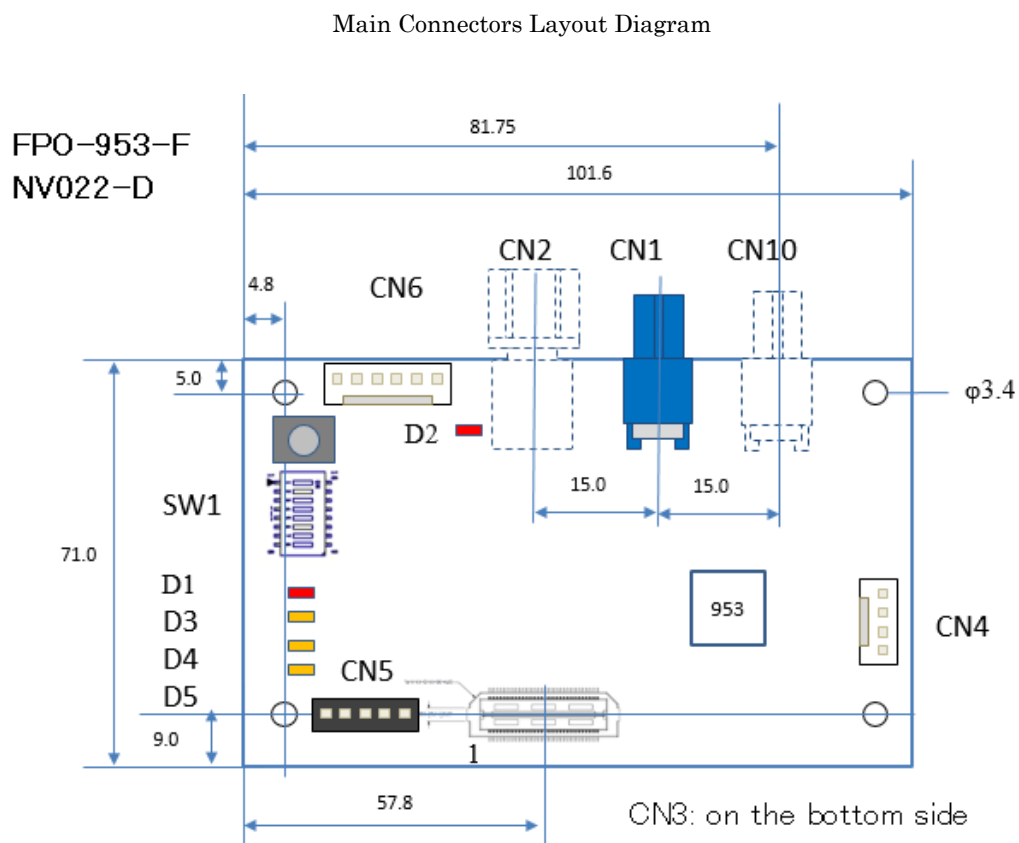
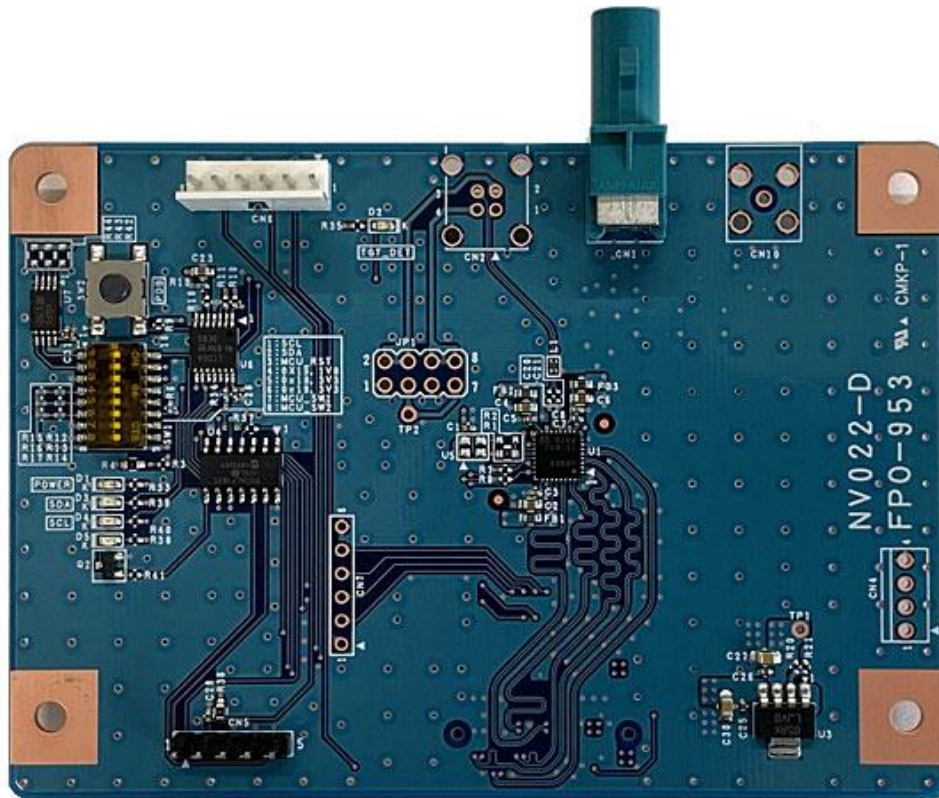## 2.　　　Shape of Board

2.1.　　Connector Layout Diagram

　　The figure below shows the arrangement of the main connectors on this board. PIN numbers and pin assignments are shown in "Connector Details" section.

Main Connectors Layout Diagram

　* Only main connectors are shown.

　* CN2, CN4, CN10 are not mounted

2.2.   Photo of Board

3.   Details

3.1.   FPD-Link III Output

Output of serializer IC DS90UB953 (DOUT +/-) are assigned as shown in the table below.

Pin	DC Coupling	Terminal	PoC	Connector
DOUT+	33nF	Not	Not	CN1
DOUT-	15nF	51Ω	Not	CN10

This board does not have a Power on Coaxial (PoC) circuit because it supplies power from the video output board such as SVO-MIPI connected to CN3.

3.2.   Connector List

CN#	Mounted State	Description	Model Number
CN1		FPD-Link III output (+)	FA1-NZRP-PCB-8
CN2	Unmounted	FPD-Link III output (Differential)	D4S20L-40MA5-Z
CN3		For connection to SVO-MIPI	QTH-030-01-L-D-A
CN4	Unmounted	I2C I/O connector	171825-4
CN5		ICSP connector for PIC implement	M20-9990545
CN6	Unmounted	Expansion connector	171825-6
CN7	Unmounted	GPIO I/O connector	A2-6PA-2.54DSA(71)
CN10	Unmounted	FPD-Link III output (-)	FA1-NZRP-PCB-8

- Mounted state applies to FPO-953-F (NV022-D)

- Expansion connector (CN6) is for board-to-board communication in the output system using multiple boards and for future expansion.

- The I2C I/O connector (CN4) is directly connected to the I2C bus of the serializer IC (DS90UB953).

3.3. Connector Details

Below is a figure of the connector on the top side of this board (outline) and pin assignment (excerpts from the schematic).

(Meaning of Signal Line)

Signal Line	Meaning
VDDIO	IO power supply (Directly connected to CN3)
VCAM	Power supply for camera
MIPI_GPIO0 - 3	Connected with GPIO0-3 of DS90UB953 Connected to pins #14,#16,#20,#22 of CN3 when implementing R59-R63
CAM_SCL / CAM_SDA	I2C signal line (connect with DS90UB953 through DIP SW)
P0_FSYNCOUT	Connected to pin #2 (GPIO0) of CN3
P3	Connected to pin #10 (GPIO3) of CN3
P4_FSYNCIN	Connected to pin #14 (GPIO4) of CN3

・CN1 (FA1-NZRP-PCB-8)
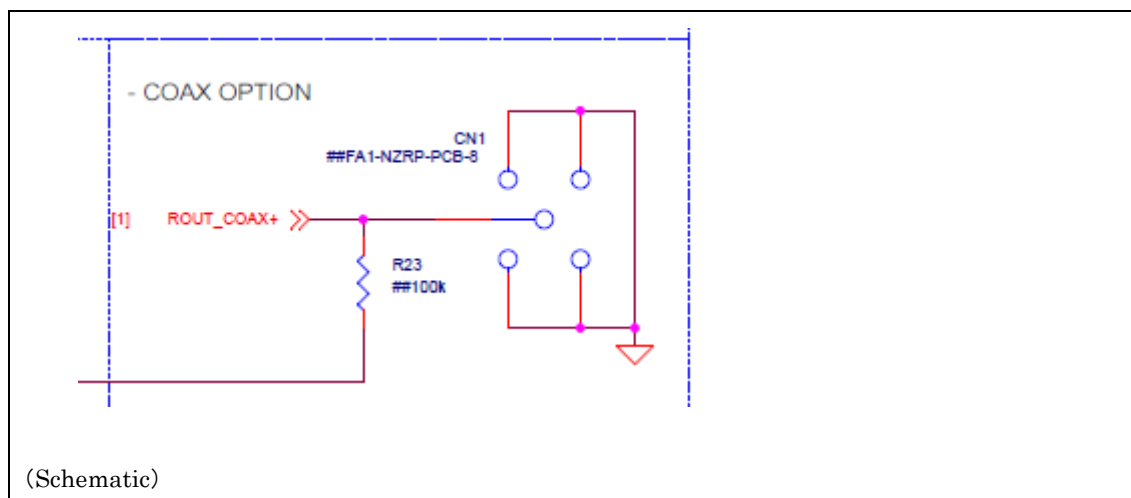
(Schematic)

・CN2 (D4S20L-40MA5-Z)
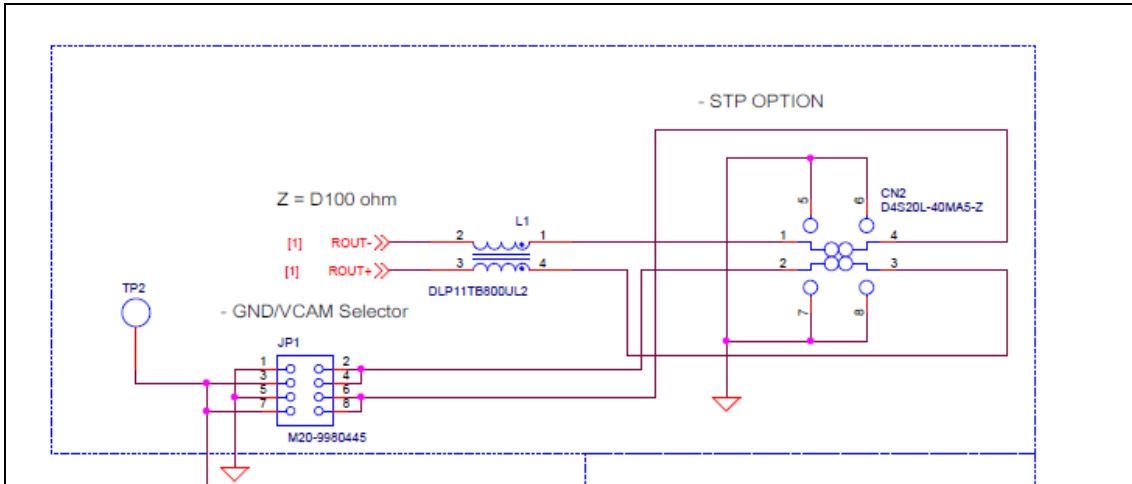
（Schematic）
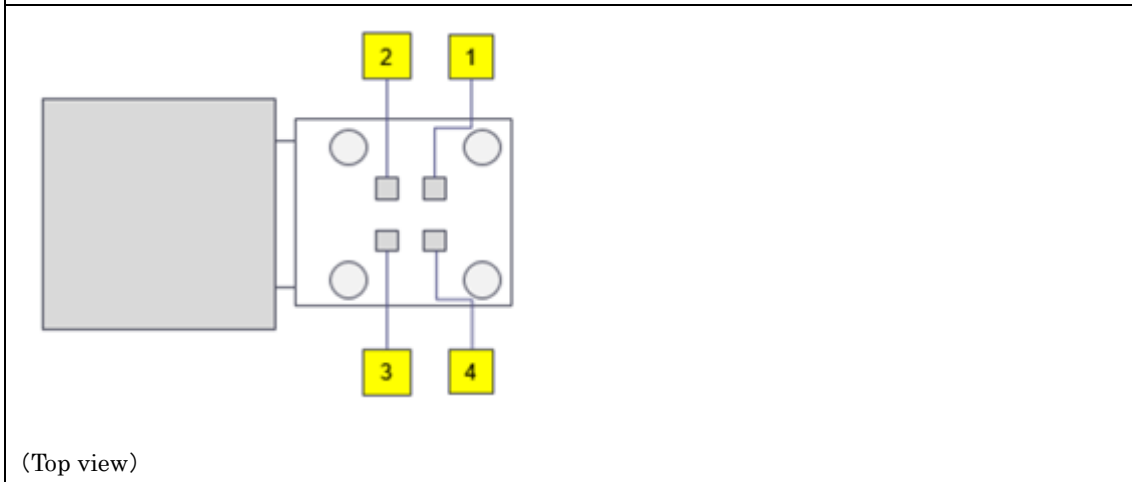
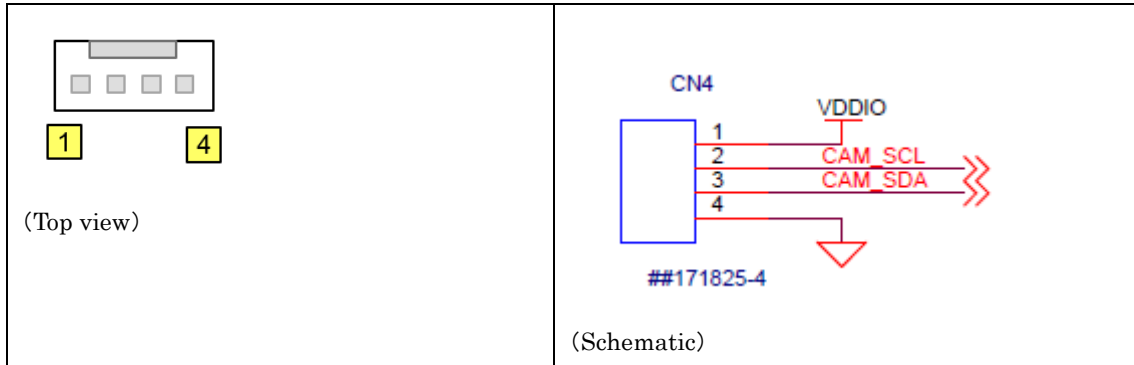（Top view）

・CN3 (QTH-030-01-L-D-A)
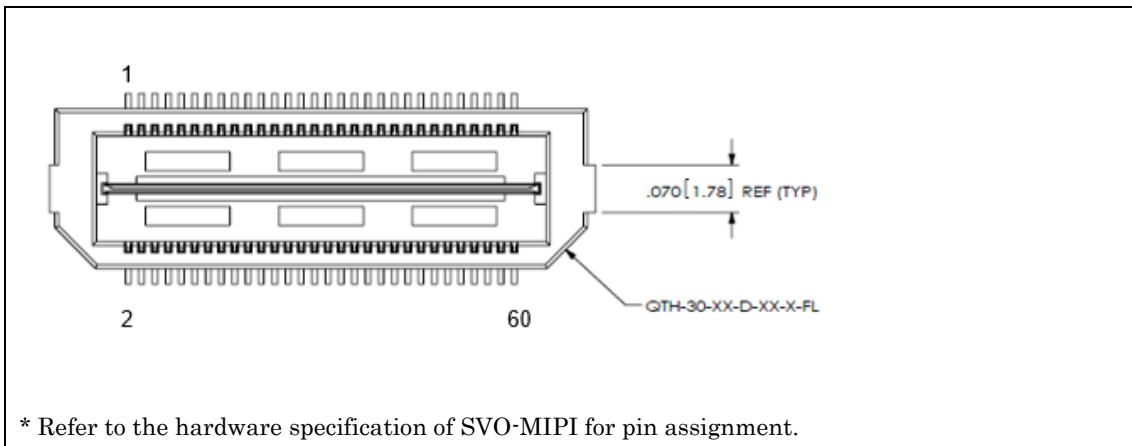
* Refer to the hardware specification of SVO-MIPI for pin assignment.

・CN4 (171825-4 / TE Connectivity)

(Top view)

(Schematic)

- Directly connected with the MAX9295A I2C bus.

- The connector is not mounted.

・CN9 (171825-6 / TE Connectivity)

(Top view)

(Schematic)
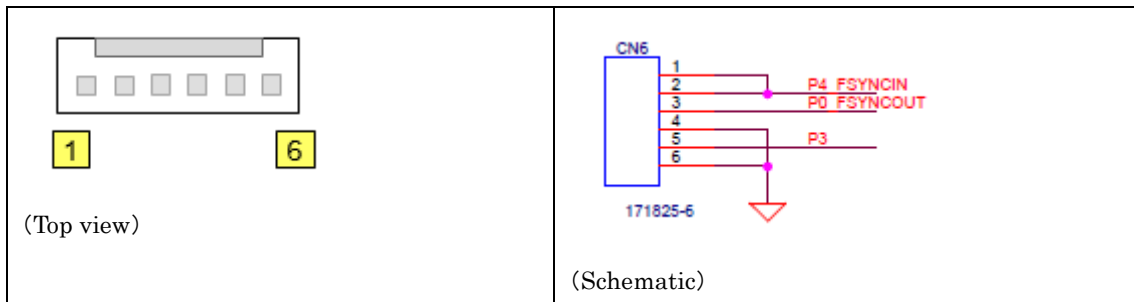
-It is assumed that synchronous wiring is performed via this connector when frame synchronization is required between multiple SVO-MIPI boards. The function of frame synchronization is custom.

・CN12 (A2-6PA-2.54DSA(71) / HRS)

(Top view)

(Schematic)
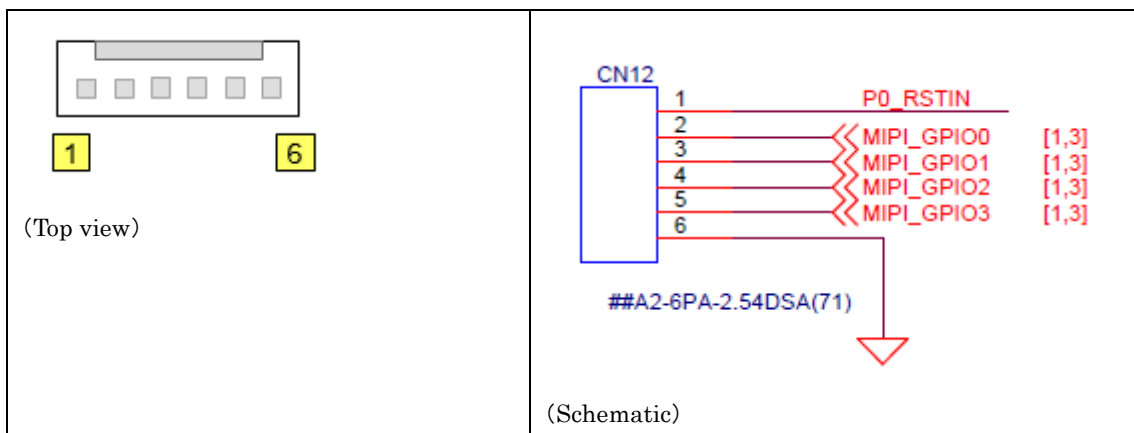
- The connector is not mounted.

3.4. Switch Settings

The 8-bit DIP switch (SW1) and the reset switch (SW2) are mounted on this board for the initial settings of the serializer DS90UB953, the setting of the I2C address, and the disconnection of the I2C bus.

3.4.1. SW1 (for DS90UB953 setting / I2C setting)

SW#	Name	Description
1	I2C_SCL	ON: The I2C bus output to CN3 (SVO side) and the I2C bus of the
2	I2C_SDA	DS90UB953 and the microcomputer are connected. OFF: Both I2C buses above are disconnected.
3	MCU_RST	ON: The microcomputer is reset and all the microcomputer IO ports including the I2C bus are Hi-Z. OFF: The microcomputer is in normal operation.
4	IDX0	This indicates the I2C address of the DS90UB953 and the IO
5	IDX1	voltage of the I2C bus as following.
6	IDX2	IDX0 | IDX1 | IDX 2 | OFF | OFF | OFF | I2C Address = 0x18, 1.8V ON | OFF | OFF | I2C Address = 0x19, 1.8V OFF | ON | OFF | I2C Address = 0x18, 3.3V OFF | OFF | ON | I2C Address = 0x19, 3.3V
7	MCU_SW1	(Reserved) Normally set to OFF.
8	MCU_SW2	(Reserved) Normally set to OFF.

- By default only SW #1 and #2 are ON.

3.4.2. SW2 (the reset switch)

While pushed, the DS90UB953 is in low-power mode (PDB = L).

3.5. LED Indicator

LED#	Name	Descriotion
D1	POWER	Lights when the board power (3.3V) is supplied
D2	TGT_DET	Lights when camera power is detected.
D3	SDA	Lights when the SDA pin of I2C bus of DS90UB953 is L.
D4	SCL	Lights when the SCL pin of I2C bus of DS90UB953 is L.
D5		Lights according to the operating status of the MCU.

3.6.　　I2C Bus

This board has one system of I2C bus, but it is possible to disconnect the I2C bus between the serializer and the SVO-MIPI board (connector CN3 side) to prevent I2C address conflict. By setting switches SW1 #1 and #2 to ON, the I2C buses of SVO board and serializer are connected. The I2C bus of the serializer DS90UB953 is also connected to the I2C I/O connector CN4. The I2C address of the DS90UB953 can be switched between 2 types with the DIP switch (SW1). Refer to "Switch Settings" section for details.

3.7.　　Power

Power for the serializer IC DS90UB953 is supplied from the connected board (SVO-03-MIPI, etc.) via CN3.　The core power supply and IO power supply are 1.8V, and the 1.8V regulator (LDO) on this board supplies power to the serializer.　The IO power supply is fixed at 1.8V, so it is necessary to set the IO voltage of SVO-03-MIPI to 1.8V.

3.8.　　GPIO

GPIO pins # 0-3 of the serializer IC (DS90UB953) are connected to GPIO pins # 8-11 (pin numbers: # 22, 26, 32, 34) of connector CN3 via 4.7kΩ resistor. Therefore, control from the SVO-MIPI board is possible. GPIO can be disconnected by not mounting R28-31.

4.   Specifications

Item	Value	Description
Board Dimensions	101.6 x 71.0 mm	Value without connector
Power for Serializer	DC +3.3V	Supplied from the power supply (3.3V) of the video output board such as SVO-MIPI via CN3, and stepped down with internal LDO.
IO Power (I2C bus)	DC +1.8V or +3.3V	When set to +3.3V, GPIO cannot be read from SVO-MIPI. Set to +3.3V for PIC program
Image Input	MIPI CSI-2 1-4 Lanes + CLK	Input from CN3 Refer to the DS90UB953 standard for details on supported formats. Connector interface depends on SVO-MIPI.
Image Output	FPD-Link III max: 4Gbps	Output from CN1 (FAKRA connector)
Serial communication	I2C	I2C bus outputs to CN3 and CN4. It has the pattern that can be implemented to the PIC microcomputer (PIC16LF1825T) to emulate the I2C communication response of the camera

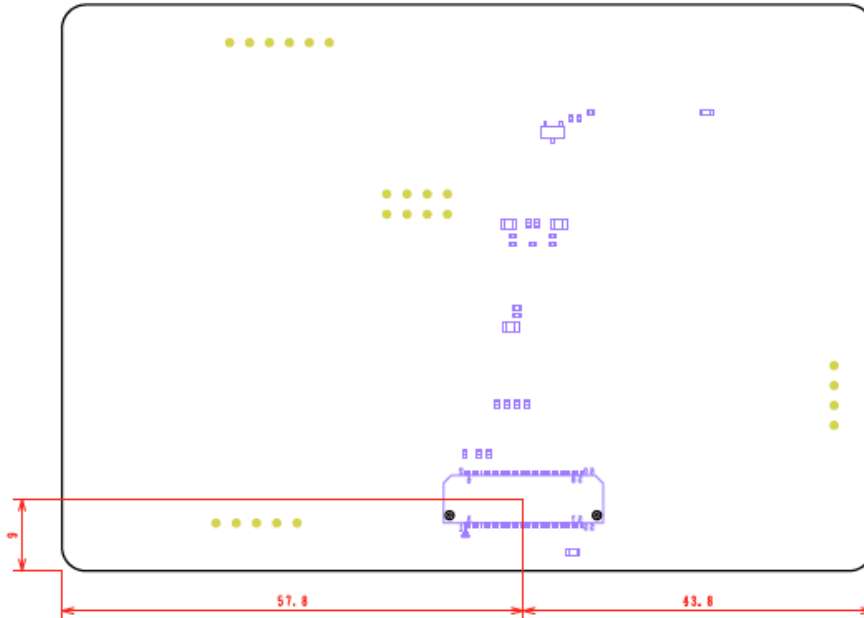* The above specifications apply only to model number FPO-953-F/ NV022-D.

5. Appendix

5.1. Figure of Board Dimensions

（Top Side / Part View）
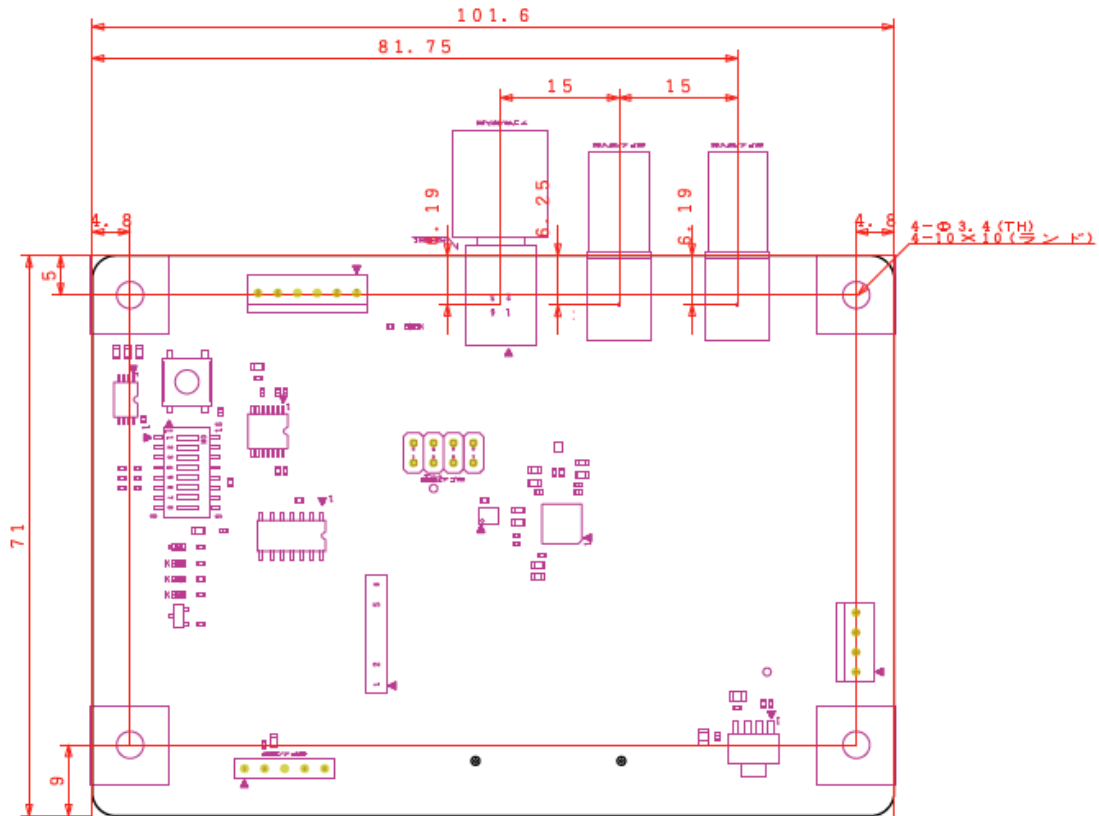
（Bottom Side / Part View）

5.2. PIC Microcomputer Peripheral Schematic