CSM.SOL

IMX415 Board-M12
for RZ/V2H Evaluation Board Kit

Hardware Manual

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SAFETY MATTERS

Definitions of Symbols

A variety of symbols are used in this document and on this product, to prevent the damage to harm and the property to you and other people beforehand by correctly using this product.

This section, Safety Matters, presents these symbols and their meanings. It also presents safety notes to assure that this produce is used safely and correctly.

This product should only be used after fully understanding the material presented in this section.

⚠ **WARNING**   Warning items indicate things that, if not avoided, could lead to death or serious injury.

⚠ **CAUTION**   Caution items indicate things that, if not avoided, could lead injury or damage to the house and household goods, etc.

In addition to the above two symbols, the following are displayed at the same time as required.

[Important]   These indicate the points which may cause a breakdown or malfunction of equipment by the incorrect setting when setting up this product.

△ indicates WARNING or CAUTION.

Example: ⚡ CAUTION AGAINST ELECTRIC SHOCK

🚫 indicates PROHIBITION.

Example: 🚫 DISASSEMBLY PROHIBITED

● inidicates a COMPULSORY ACTION.

Example: ❗ COMPULSORY ACTION

⚠ WARNING

Handling Related Warnings:

Always check the jumper and switch settings before connecting a power source. An incorrect jumper or switch setting can lead to internal heat generation, rupture, ignition, or damage to this evaluation board itself or any connected equipment.

If, during either the use or storage of this product, any abnormality in the product itself (including abnormal odors, heating, color changes, or changes to the shape of the product) are observed, disconnect the AC adapter immediately.
The incidence of such an abnormality may result in rupture, ignition, or performance deterioration. Therefore, do not use this product in such a situation.

Installation:

Do not install this product in a location that has a high humidity or where water or other fluids could get on it. This product may be damaged if water or other fluids can get on it.

Ambient Temperature:

The ambient temperature range for using this product is from 0°C to 60°C.

⚠ CAUTION

Handling:

❶ This product must be handled carefully. Do not cause a strong impact by dropping it, letting it fall, etc.

Do not touch this product's component pins with bare hands. Doing so may discharge static electricity that damages the Internal circuits. Eliminate static electricity before touching this product.

When connecting or disconnecting cables to or from this product, hold the parts of the cable intended to be grasped (such as the plugs) and avoid putting stress on the cable. Do not pull this product etc. while it is connected with a communications interface cable. Doing so may cause the cable to be disconnected.

When connecting a cable to a connector, do not insert the plug in the reverse direction or upside down. Incorrect insertion may damage this product or connected equipment.

Always check the jumper and switch settings before connecting a power source. An incorrect jumper or switch setting can lead to damage to this product or connected equipment.

Do not handle this product with wet hands. Doing so can lead to failure of the product.

Transport methods:

❶ When transporting this product, use the product's packing box and cushioning materials and ship it with precision equipment handling. If the products packing is insufficient, it may be damaged during shipping.
If it must be transported by some other method, pack it carefully as precision equipment.
When packing this product, always use the antistatic pouch included with this product.
If some other pouch is used, electrostatic discharge may damage the product.

Abnormal operation:

❶ If operation of this product becomes abnormal due to interference from external noise etc., apply the following procedure.

　1. Turn off the power.
　2. Wait 10 or over seconds and then turn the power back on.

Disposal:

❶ When disposing of this product, be sure to dispose it as industrial waste according to all applicable laws.

Table of Contents

1. Overview

This board is an image sensor board (IMX415 Board-M12) for connecting to an evaluation kit for RZ/V2H MPU from Renesas Electronics Corporation. (RZ/V2H evaluation board kit, hereafter V2HEVK). This manual describes the hardware functions of IMX415 Board-M12.

This board is an optional board sold separately from V2HEVK.

It also describes how to connect to the RZ/V2N Evaluation Board Kit. (See Appendix B).

The configuration required to operate the image sensor board is as below.

Table 1.1-1   Required Boards for IMX415 board-M12

Board Name	Overview
RZ/V2H Secure Evaluation Board (CPU board)	• The RZ/V2H is mounted. • Board on which the main functional components for the RZ/V2H are mounted.
RZ/V2H EVK Expansion Board (EXP board)	• Connected to J1, J2 and J4 on the RZ/V2H Secure Evaluation Board. • Board on which the HDMI, audio, and Pmod interfaces.
IMX415 Board-M12 (option)	• Connected to the MIPI CSI-2 connector (CN7, CN8, CN9, CN10) on the RZ/V2H CPU Board. • Image sensor board. (on which IMX415 is mounted)

The following documents have been prepared for IMX415 Board-M12.
Make sure to refer to the latest versions of these documents. For more information, contact a CSM SOLUTION sales representative.

Table 1.1-2   Documents list

Document Type	Document Title	Document No.	Description
Hardware manual	IMX415 Board-M12 for RZ/V2H Evaluation Board Kit Hardware Manual	This document	Hardware specifications of IMX415 Board-M12 for connecting to V2HEVK.

The following documents have been prepared for V2HEVK. Make sure to refer to the latest versions of these documents. For the development environment including software, contact a Renesas Electronics sales representative.

Table 1.1-3   Documents List

Document Type	Document Title	Renesas Website	Description
Hardware manual	RZ/V2H Evaluation Board Kit (Secure type) Hardware Manual	https://www.renesas.com/us/en/products/microcontrollers-microprocessors/rz-mpus/rzv2h-evk-rzv2h-quad-core-vision-ai-mpu-evaluation-kit	Hardware specifications of the V2HEVK
User's Manual: Hardware	RZ/V2H Group User's Manual: Hardware	https://www.renesas.com/us/en/products/microcontrollers-microprocessors/rz-mpus/rzv2h-quad-core-vision-ai-mpu-drp-ai3-accelerator-and-high-performance-real-time-processor	RZ/V2H hardware specifications (pin assignments, memory maps, peripheral specifications, electrical characteristics, and timing charts) and descriptions of operation

1.1   Features

IMX415 board-M12 includes the following features.

- IMX415 CMOS Image Sensor : 1 ch

- V2HEVK connector : 1 ch (CN1 [22pin])

- Timing signal connector for image sensor synchronization : INPUT 1ch (CN2 [4pin]) / OUTPUT 1ch (CN3 [4pin])

- Power supply for the IMX415 CMOS image sensor

- Power sequence control for the IMX415 CMOS image sensor
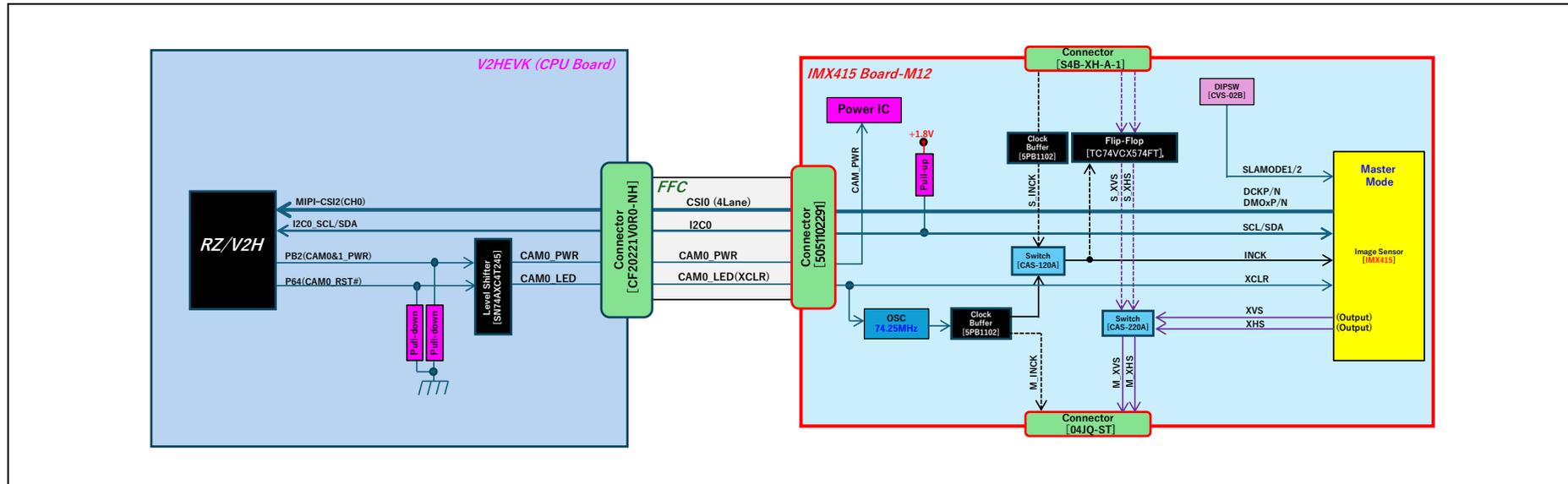
1.2 Block Configuration

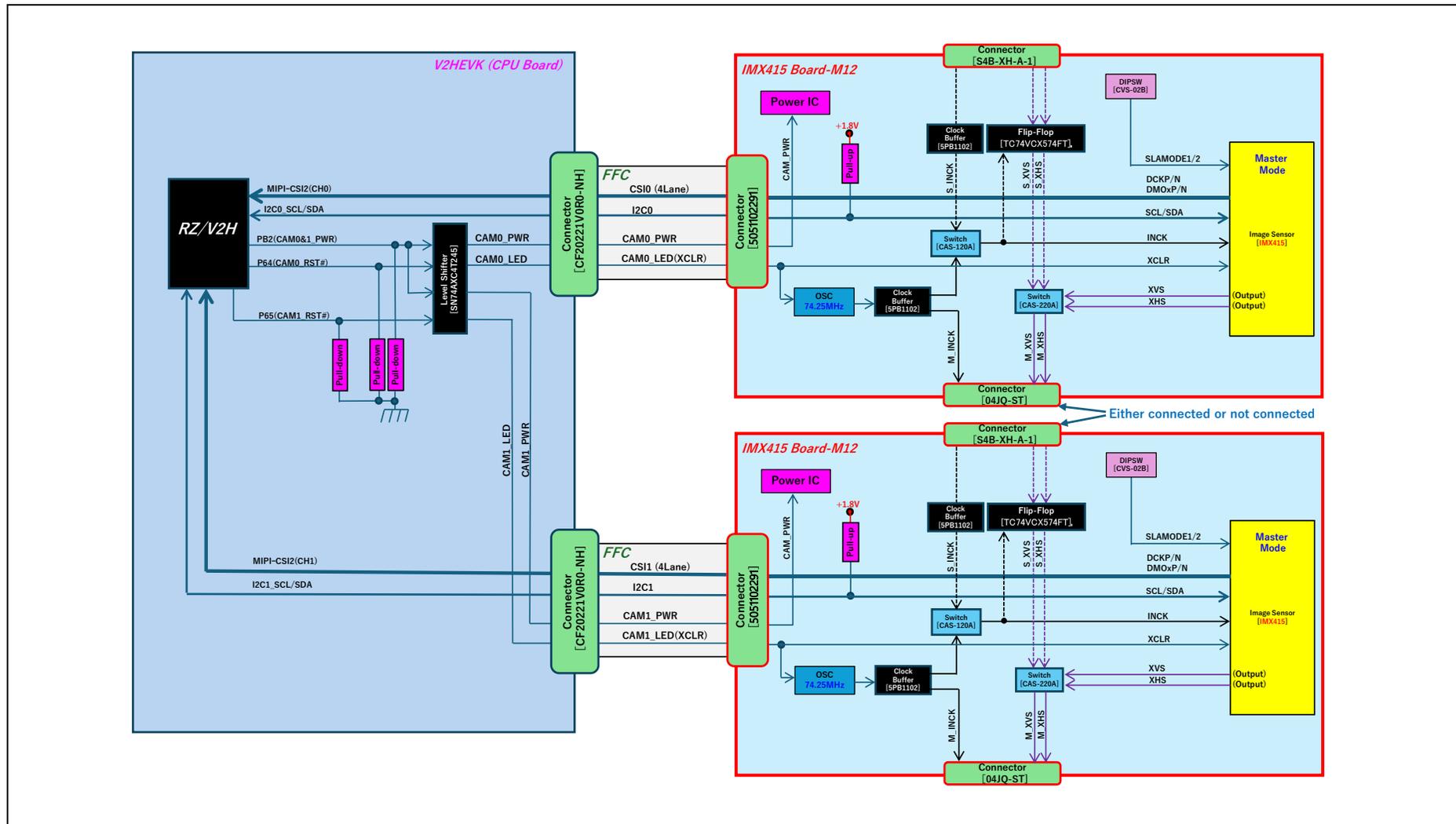Figure 1.2-1   IMX415 Board-M12 Block Diagram (Single Sensor Mode)

Figure 1.2-2   IMX415 Board-M12 Block Diagram (Dual Sensor Mode [Synchronous])

Figure 1.2-3   IMX415 Board-M12 Block Diagram (Dual Sensor Mode [Asynchronous])

2.   Specifications

2.1   IMX415 Board-M12 Specifications

Table 2.1-1   IMX415 Board-M12 Specifications

Item	Specification
CMOS image sensor	IMX415 (Made by SONY)
Lens Mount	M12 Mount (Lens included in this product.)
Board size	52 × 40 × 1.6 mm (at bare board condition)
V2HEVK Connector	Connector: 22 pins with 0.5-mm pitch For connecting to the V2HEVK via FFC cable.
Timing signal Connector	Connector: 4 pins with 2.5-mm pitch For connecting to the another IMX415 board-M12. (Only in Dual Sensor Mode)
FFC cable (provided)	22 Position, 0.50mm pitch, 100mm

2.2   Outer Appearance
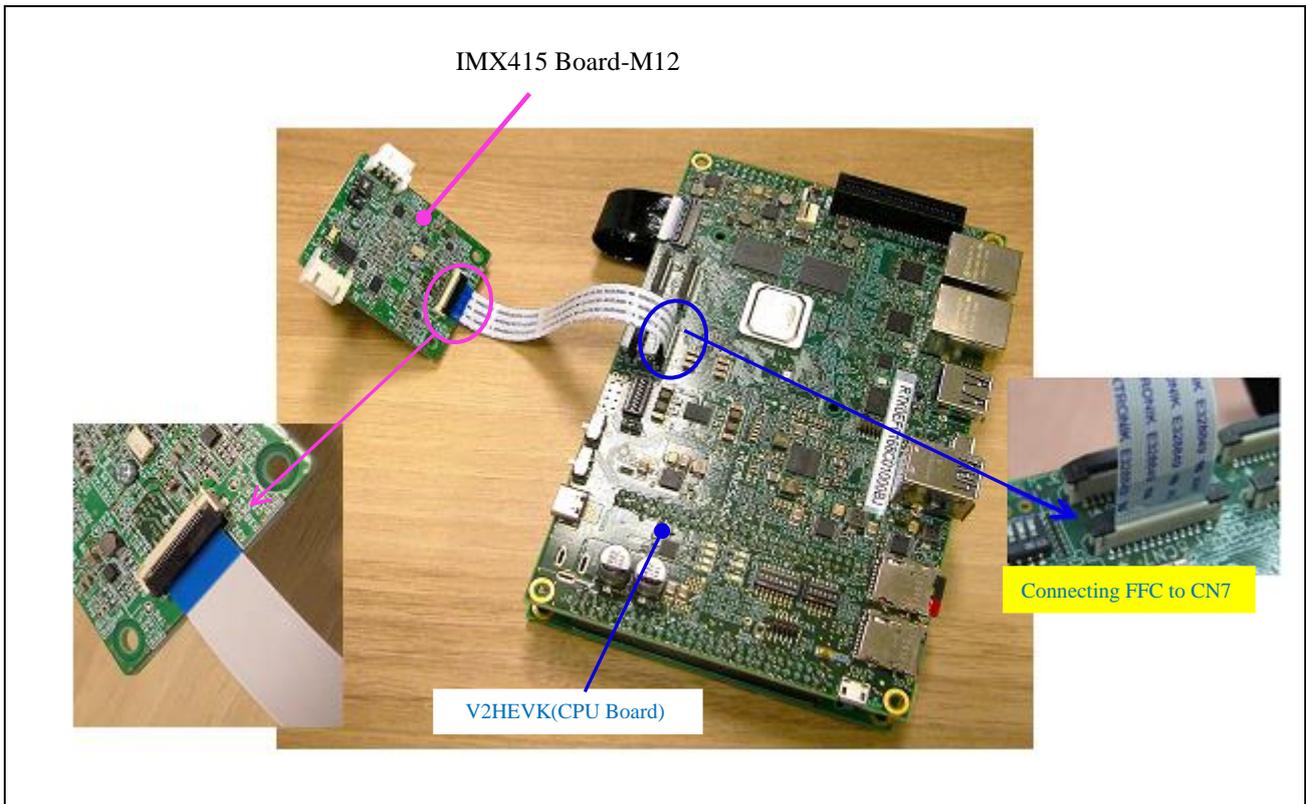
Figure 2.2-1   Outer Appearance of V2HEVK (with IMX415 Board-M12 : Single Sensor Mode)
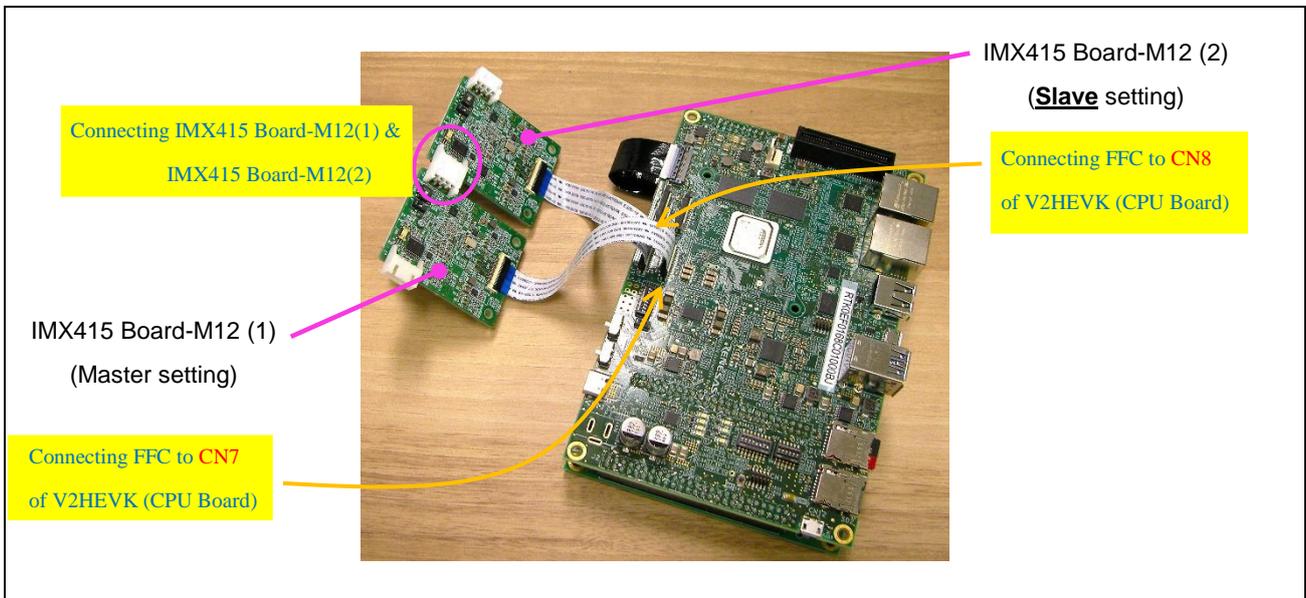
Figure 2.2-2   Outer Appearance of V2HEVK (with IMX415 Board-M12 : Dual Sensor Mode [Synchronous])
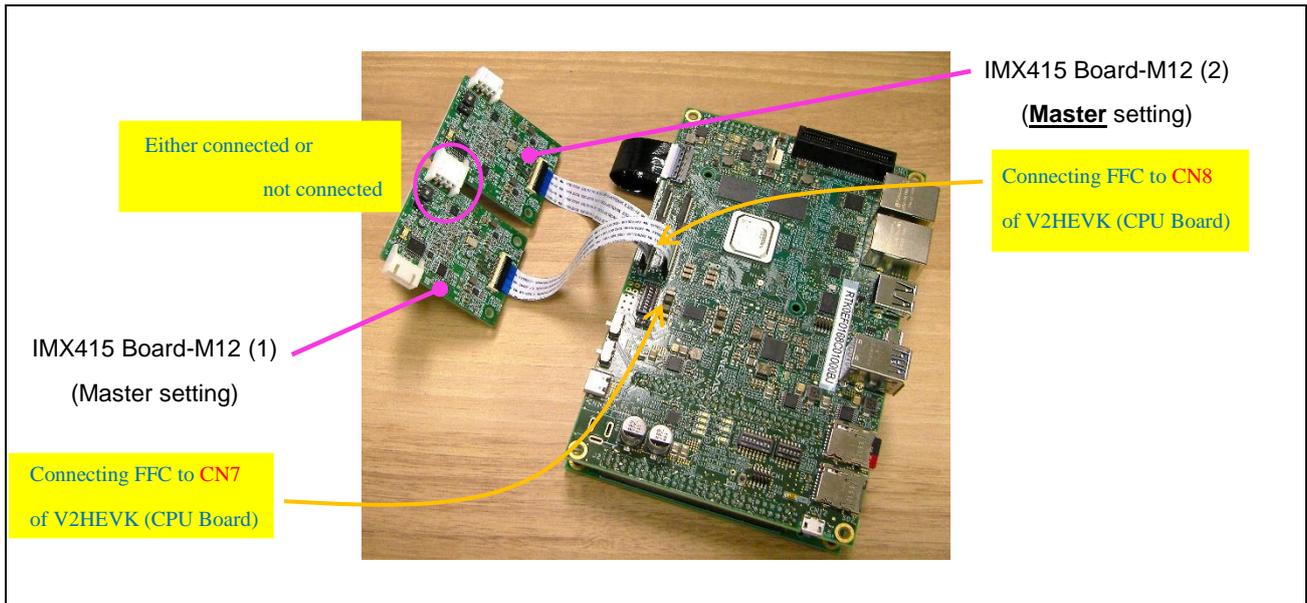
Figure 2.2-3　　Outer Appearance of V2HEVK (with IMX415 Board-M12 : Dual Sensor Mode [Asynchronous])

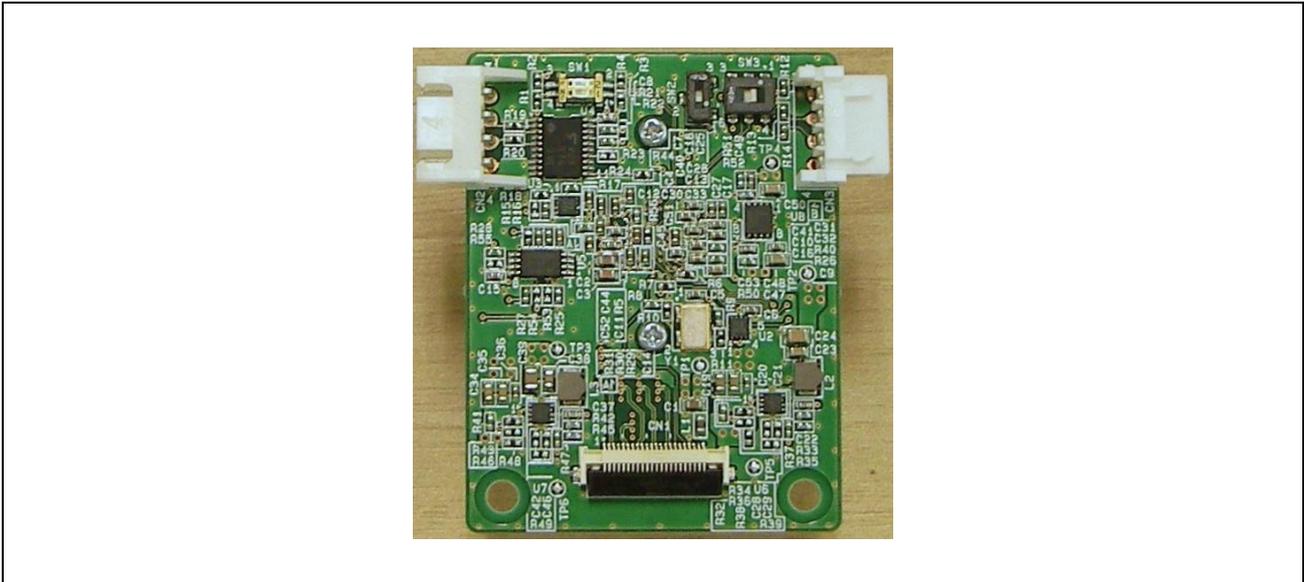Figure 2.2-4   IMX415 Board-M12 (IMX415 sensor side)

Figure 2.2-5   IMX415 Board-M12 (V2HEVK connector side)

3. Operating Procedure

3.1 Assembly (Single Sensor Mode)

The V2HEVK and IMX415 board-M12 are connected with FFC.

FFC is connected with following procedure:

1. Open the FFC locking cover, align the FFC contacts to the bottom, and close the cover until it locks.

The cover is fragile, so handle with care.
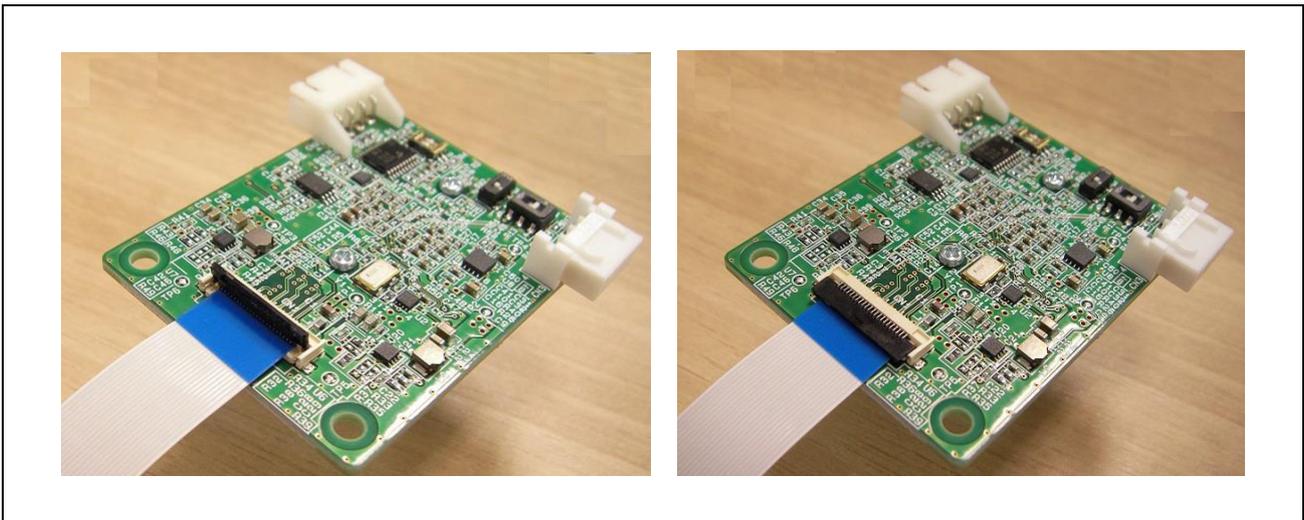
Figure 3.1-1   Connect FFC to IMX415 Board-M12.

2. Connect the FFC to V2HEVK (CPU Board).
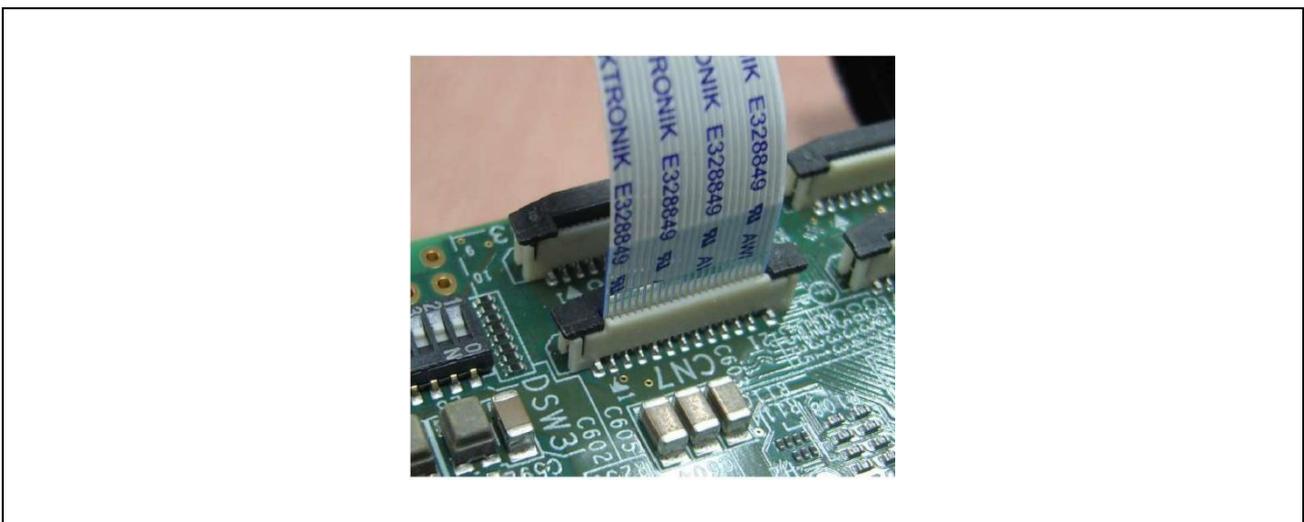
The cover is fragile, so handle with care.

Figure 3.1-2   Connect FFC to RZ/V2H Secure Evaluation Board.

3.2   Assembly (Dual Sensor Mode [Synchronous/Asynchronous])

Connect the two IMX415 board-M12 together with the on-board connector.

Be sure to connect this when using the Dual Sensor Mode [Synchronous]. If you are using the Dual Sensor Mode [Asynchronous], you do not need to connect it (there is no problem if you connect it).

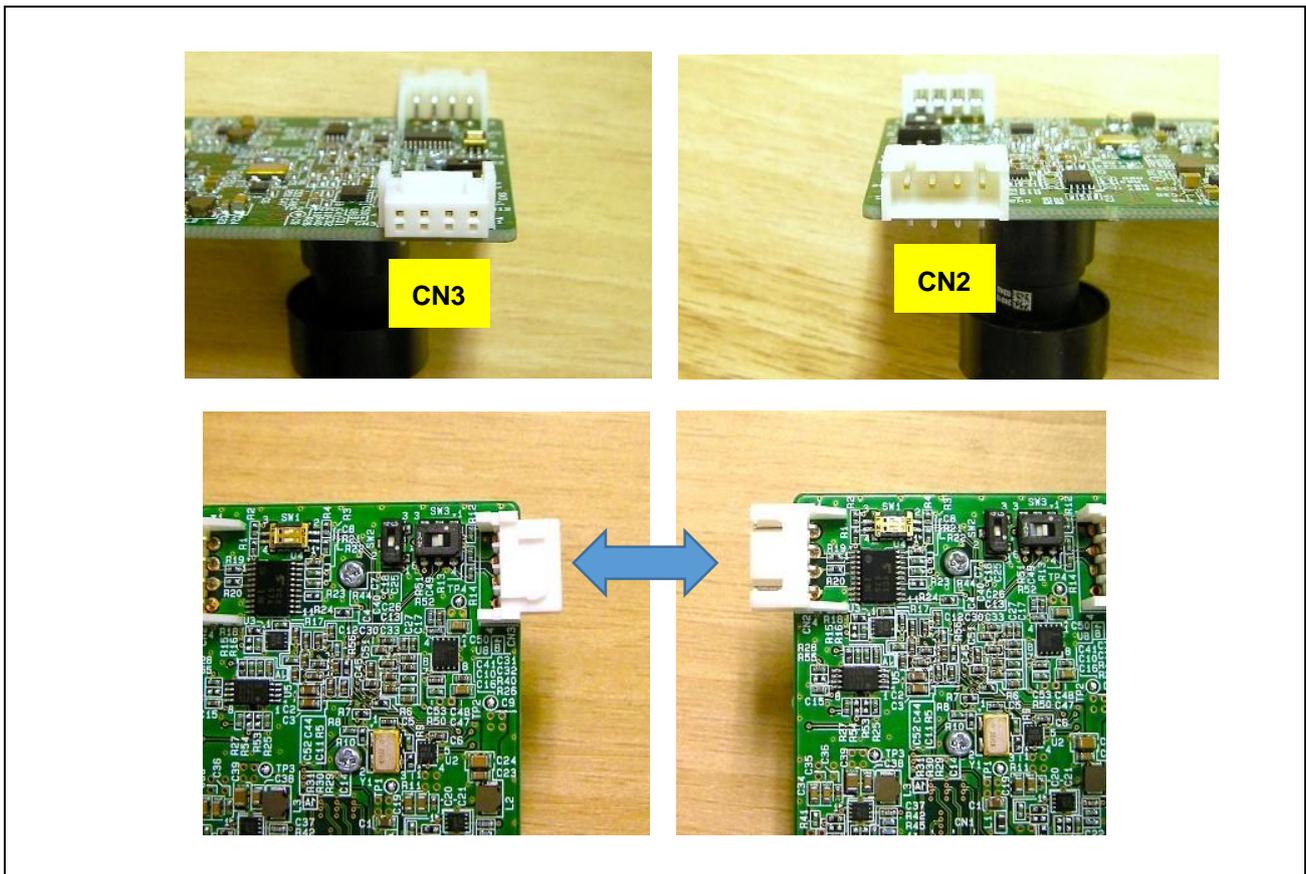1. Connect CN3 of the first unit (master setting) to CN2 of the second unit (slave setting).

Figure 3.2-1   Connect the on-board connectors of the IMX415 board-M12.

2. Connect the FFC in the same way as in single sensor mode.

3.3   Operation Switch Setting

The table below lists the settings of the slide switch on the IMX415 Board-M12 and RZ/V2H Evaluation Board Kit.

3.3.1   Switch Setting (Single Sensor Mode)

Table 3.3-1   Switch settings in Single Sensor Mode

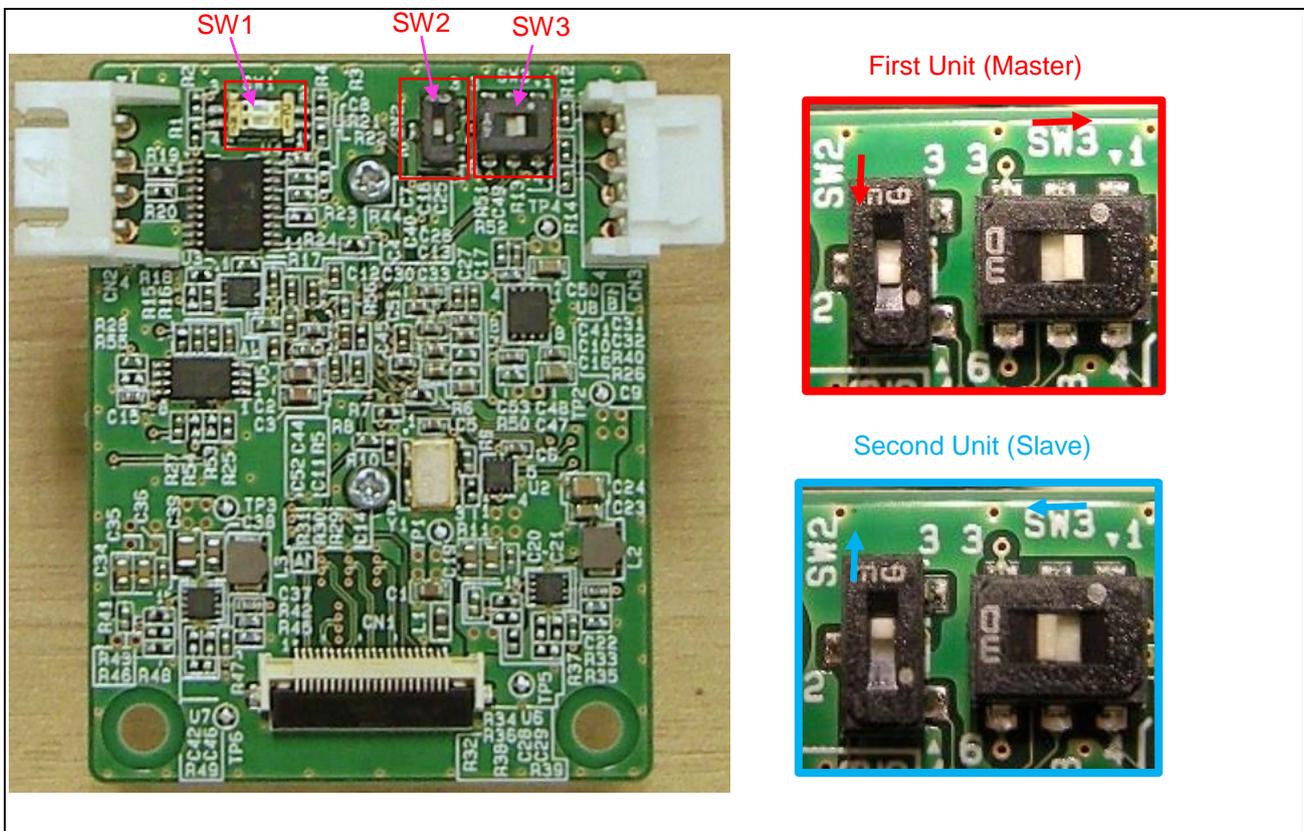| No	Part Symbol	Setting
1	SW1	1:OFF 2:OFF
2	SW2	ON (Master Mode)
3	SW3	ON (Master Mode)
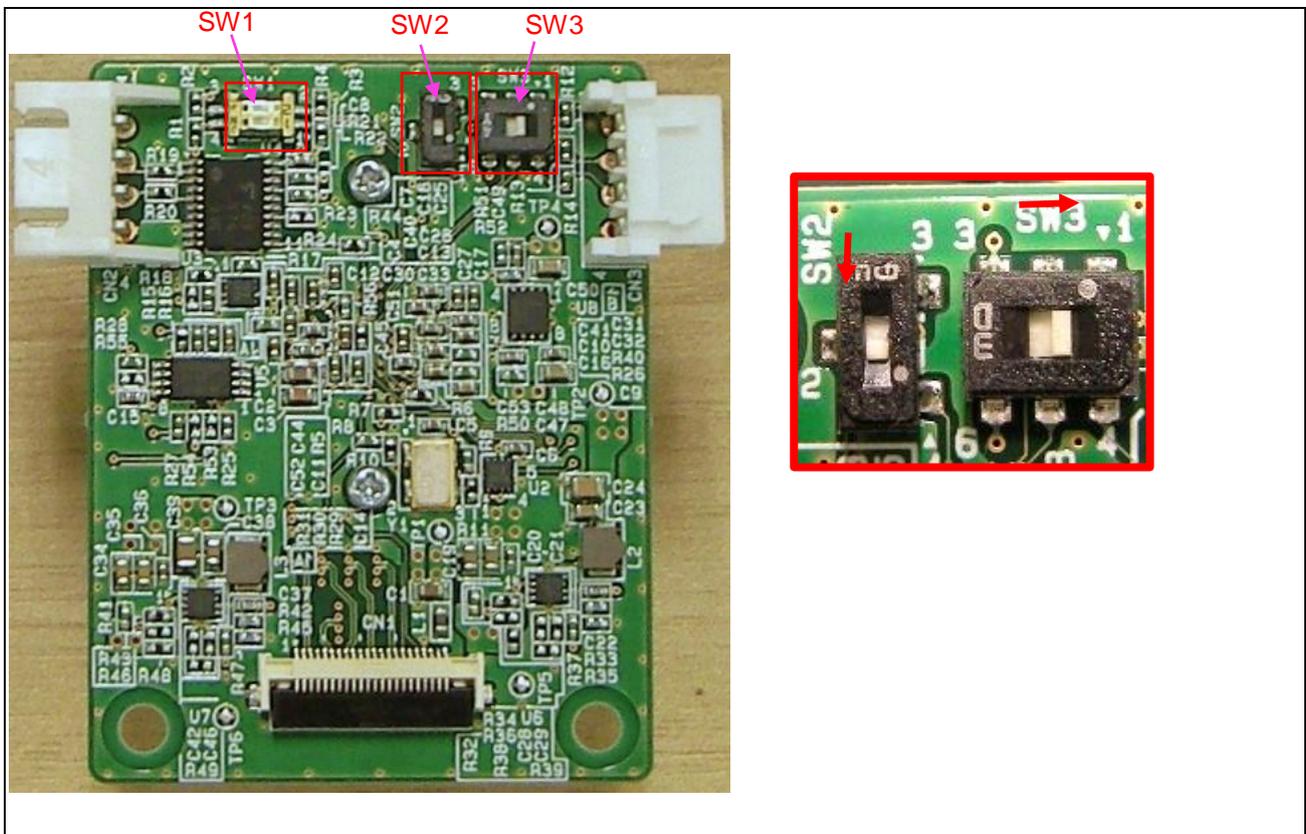
Figure 3.3-1   Switch Setting in Single Sensor Mode

3.3.2   Switch Setting (Dual Sensor Mode [Synchronous])

Table 3.3-2   Switch settings in Dual Sensor Mode [Synchronous]

No	Part Symbol	Setting
First Unit (Master)		
1	SW1	1:OFF 2:OFF
2	SW2	ON (Master Mode)
3	SW3	ON (Master Mode)
Second Unit (Slave)		
1	SW1	1:OFF 2:OFF
2	SW2	OFF (Slave Mode)
3	SW3	OFF (Slave Mode)

Figure 3.3-2   Switch Setting in Dual Sensor Mode [Synchronous]

3.3.3 Switch Setting (Dual Sensor Mode [Asynchronous])

Table 3.3-3   Switch settings in Dual Sensor Mode [Asynchronous]

No	Part Symbol	Setting
First Unit (Master)		
1	SW1	1:OFF 2:OFF
2	SW2	ON (Master Mode)
3	SW3	ON (Master Mode)
Second Unit (Master)		
1	SW1	1:OFF 2:OFF
2	SW2	ON (Master Mode)
3	SW3	ON (Master Mode)
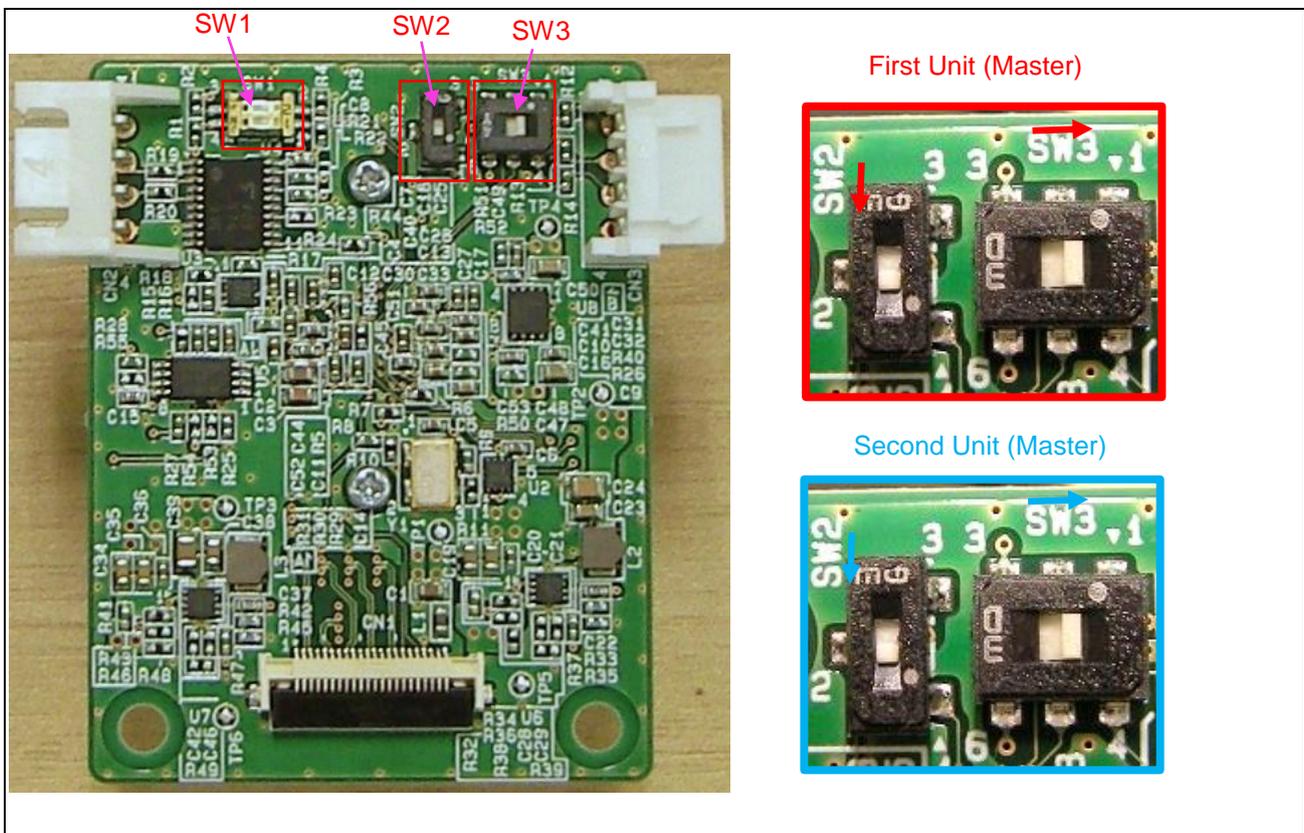
Figure 3.3-3   Switch Setting in Dual Sensor Mode [Asynchronous]

3.3.4   Switch Setting (RZ/V2H Evaluation Board Kit)

Table 3.3-4   Switch settings in RZ/V2H Evaluation Board Kit

No	Part Symbol	Setting
1	JSW1	1-2: MIPI CSI-2 Camera Interface Voltage: 1.8V
2	DSW3	ALL OFF I2C signal Pull-Up OFF for MIPI CSI-2[Ch0-Ch3].

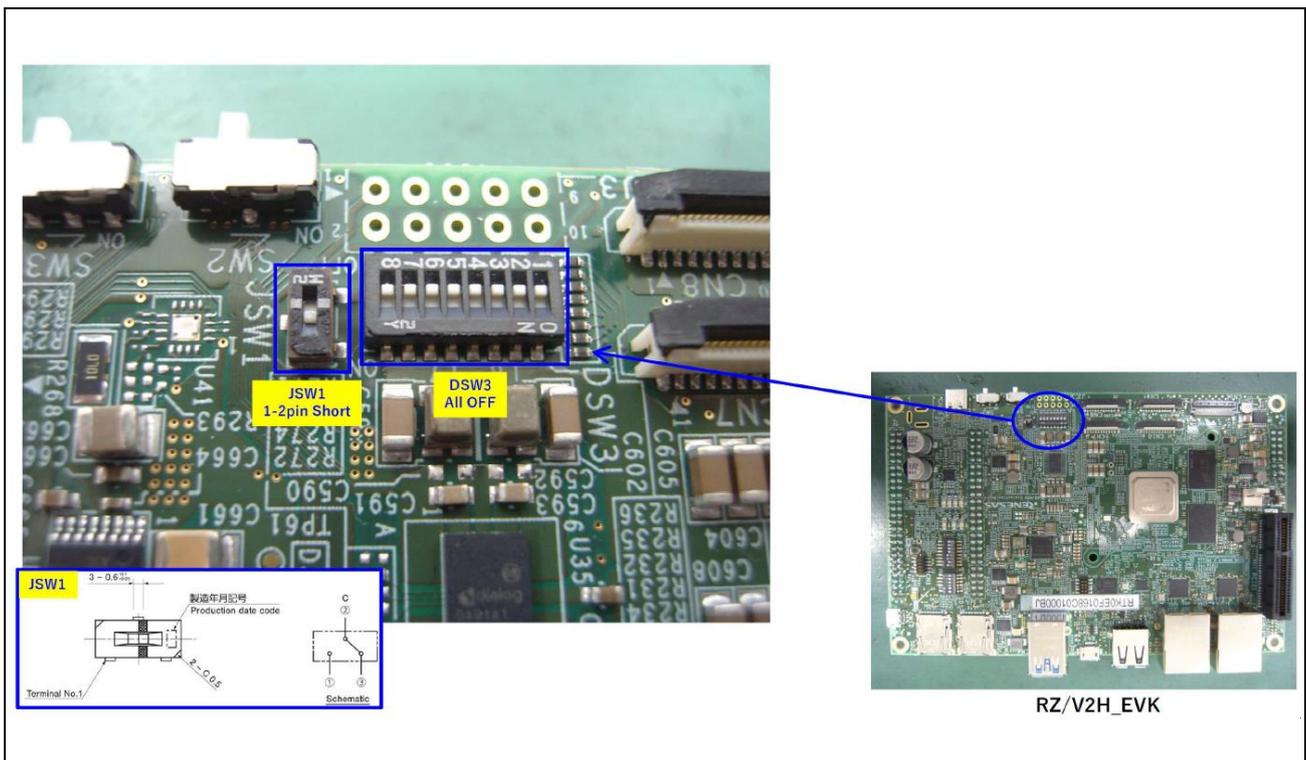 * detailed functions, please refer to the RZ/V2H Evaluation Board Kit Hardware Manual.

Figure 3.3-4   Switch Setting in RZ/V2H Evaluation Board Kit

3.4   Lists of Main Parts

Table 3.4-1 list the main parts of the IMX415 Board-M12.

Table 3.4-1   IMX415 Board-M12 Parts List

No.	Quantity	Part Symbol	Part Name	Manufacturer
1	1	U1	IMX415-AAQR	Sony
2	2	U2, U3	5PB1102CMGI8	Renesas Electronics
3	1	U5	S-77101A11-T8T1U4	ABLIC
4	2	U6, U7	ISL8002IRZ-T7A	Renesas Electronics
5	1	U8	ISL80505IRAJZ	Renesas Electronics

4.   Interface Specifications

This section describes the interface specifications of the IMX415 Board-M12.

4.1   MIPI CSI-2 Interface

Caution

It is different from the Raspberry Pi camera interface. When connecting the Raspberry Pi, carefully confirm each signal connection. Incorrect connections may damage the board or module.

Table 4.1-1   V2HEVK connector (CN1)

Pin No.	Connection		Pin No.	Connection
1	GND		12	CAM_D2_P
2	CAM_D0_N		13	GND
3	CAM_D0_P		14	CAM_D3_N
4	GND		15	CAM_D3_P
5	CAM_D1_N		16	GND
6	CAM_D1_P		17	POW_ENB
7	GND		18	XCLR
8	CAM_CK_N		19	GND
9	CAM_CK_P		20	SCL
10	GND		21	SDA
11	CAM_D2_N		22	+3.3V input

4.2   Timing signal connector

The IMX415 board-M12 has a timing sync signal connector for dual sensor mode. Input (CN2) and Output (CN3) .

Table 4.2-1   Timing Signal Input Connector (CN2)

Pin No.	Connection
1	INCK_I
2	XVS_I
3	XHS_I
4	GND

Table 4.2-2   Timing Signal Output Connector (CN3)

Pin No.	Connection
1	INCK_O
2	XVS_O
3	XHS_O
4	GND

4.3   Switches

The IMX415 Board-M12 has three switches. Table 4.3-1 list the functions of the respective switches.

Table 4.3-1   IMX415 Board-M12 Switch

| Switch	Usage				
SW1	IMX415 I2C Slave Address				
		1	2	Write	Read
		OFF	OFF	34H	35H
		OFF	ON	20H	21H
		ON	OFF	6CH	6DH
		ON	ON	6EH	6FH
SW2	Clock Select				
		OFF	External clock use (Slave Mode)		
		ON	Internal clock use (Master Mode)		
SW3	Sync Signal (VS/HS) Select				
		OFF	External signal use (Slave Mode)		
		ON	Internal signal use (Master Mode)		

Appendix A   Attached M12 Lens Specification

The Optical Specifications of the M12 Lens mounted on the IMX415 board-M12 are shown below.

Optical Specifications

Item	Detail
Product Number	DSL401A-660-F2.8
Maker	Sunex
Nominal Imager Format	Up to 1/2"
Imager Resolution	Up to 16MP
Focal Length	2.8 mm
Relative Aperture (F/#)	F/2.8
Image Circle	8.0 mm
Field of View	73˚ at 4.6mm image circle
	92˚ at 6.2mm image circle
	108˚ at 7.8mm image circle
Total Track Length	24 mm
Distortion	+29% from F-θ, <13% rectilinear
Chief Ray Angle	14˚ at 8.0mm image circle, linear
IR cut-off filter	Optional 660 nm IR cutoff filter

The focal length can be adjusted by changing the screw-in of the lens.

The focal length has not been adjusted and the lenses have not been glued in place when shipped. Please adjust as necessary.

*The above image shows the lens rotated counterclockwise.
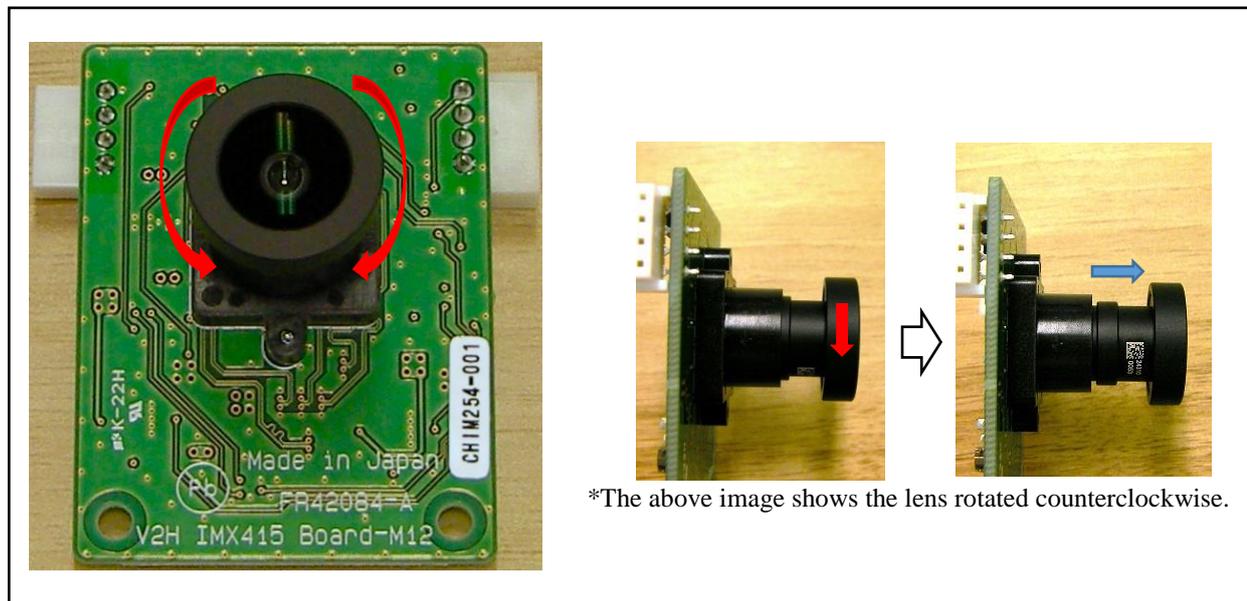
# Appendix B   Connecting to the RZ/V2N Evaluation Board Kit

The following documents have been prepared for V2NEVK. Make sure to refer to the latest versions of these

documents. For the development environment including software, contact a Renesas Electronics sales representative.

Documents List

Document Type	Document Title	Renesas Website	Description
Hardware manual	RZ/V2N Evaluation Board Kit (Secure Type) User's Manual	https://www.renesas.com/en/products/microcontrollers-microprocessors/rz-mpus/rzv2n-evk-rzv2n-quad-core-vision-ai-mpu-evaluation-kit	Hardware specifications of the V2NEVK
User's Manual: Hardware	RZ/V2N Group User's Manual: Hardware	https://www.renesas.com/en/products/microcontrollers-microprocessors/rz-mpus/rzv2n-15tops-quad-core-vision-ai-mpu-2-camera-connection-and-excellent-power-efficiency	RZ/V2N hardware specifications (pin assignments, memory maps, peripheral specifications, electrical characteristics, and timing charts) and descriptions of operation

The following explains how to connect to the RZ/V2N Evaluation Board Kit.

Outer Appearance
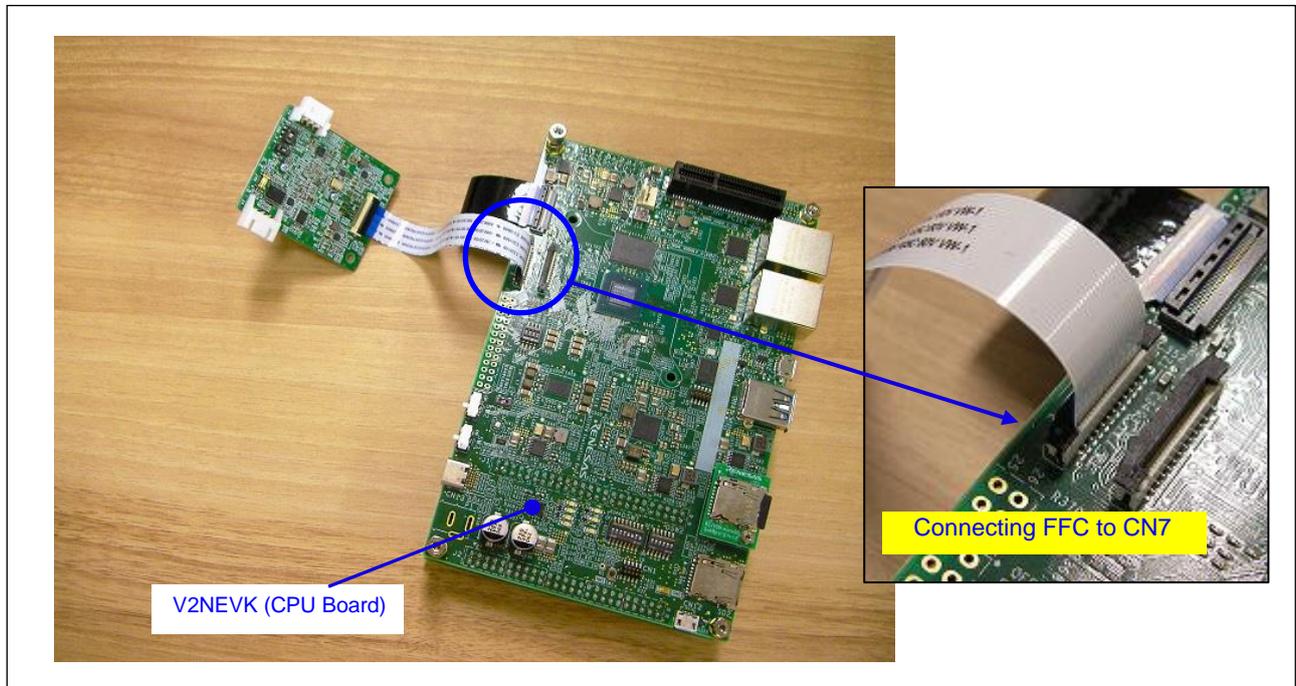
**Figure. 1** Outer Appearance of V2NEVK (with IMX415 Board-M12 : Single Sensor Mode)
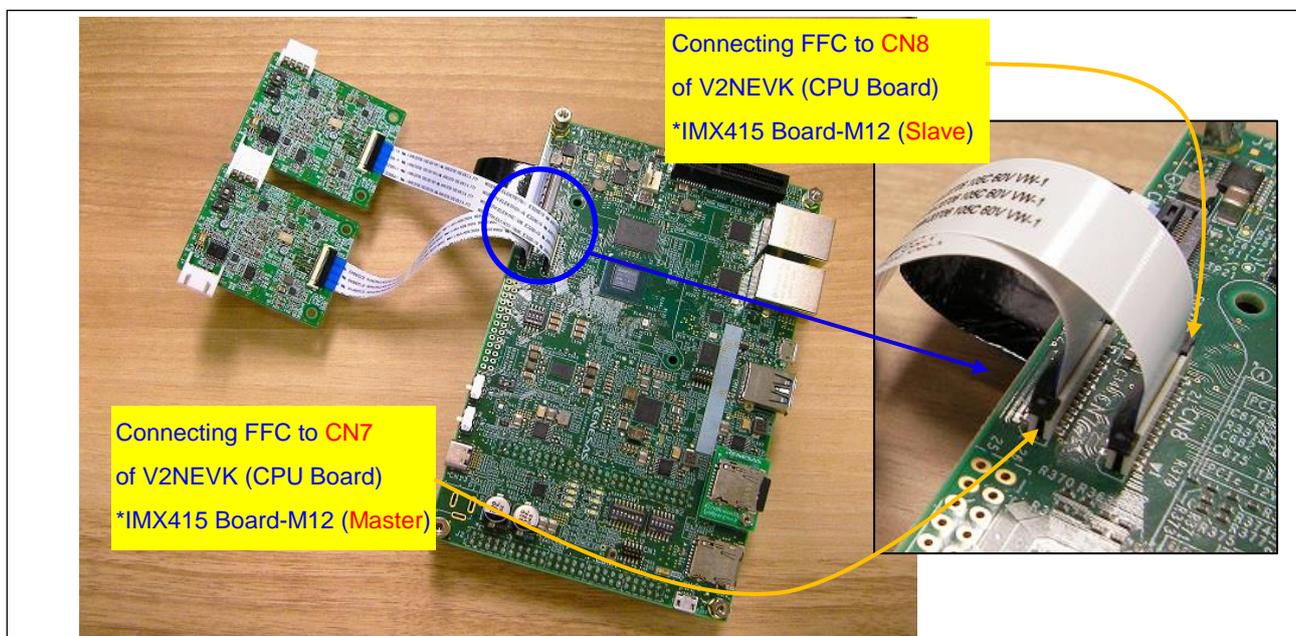
Figure. 2 Outer Appearance of V2NEVK (with IMX415 Board-M12 : Dual Sensor Mode)

Switch Setting (RZ/V2N Evaluation Board Kit)

Table. 1   Switch settings in RZ/V2N Evaluation Board Kit

No	Part Symbol	Setting
1	JSW1	1-2: MIPI CSI-2 Camera Interface Voltage: 1.8V
2	DSW3	ALL OFF
		I2C signal Pull-Up OFF for MIPI CSI-2[Ch0-Ch1].

  * detailed functions, please refer to the RZ/V2N Evaluation Board Kit Hardware Manual.
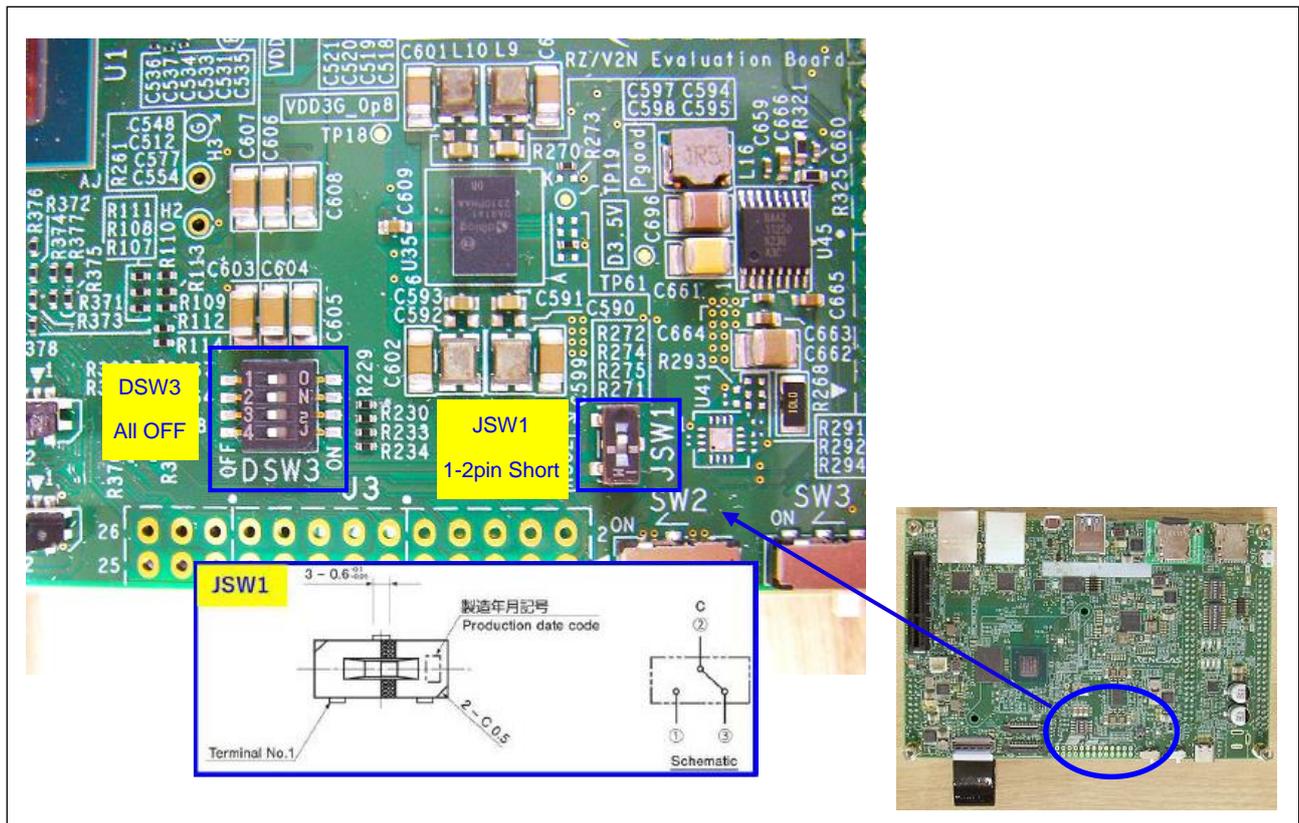
Figure. 3   Switch Setting in RZ/V2N Evaluation Board Kit

REVISION HISTORY	IMX415 Board-M12 for RZ/V2H Evaluation Board Kit Hardware Manual

Rev.	Date	Page	Description
			Summary
1.00	May 12, 2025	—	First edition issued