eCUBE DVP DEVELOPMENT PLATFORM
USER GUIDE
Version 1, April 2022

1- Welcome and disclaimer

Thank you for choosing LACROIX Impulse eCUBE DVP development platform material to be used together with Renesas automotive V3x Starter Kit. We hope you will enjoy this product. Do not hesitate to contact eCUBE DVP technical support team in case of questions or eCUBE DVP operating not as expected.

This material shall be used exclusively in R&D lab office, manipulated by engineering professionals knowledgeable in electronics, and used for evaluation purpose only. Renesas V3H Starter Kit shall be purchased separately.

Please read and carefully follows instructions how to plug V3H Starter Kit to make sure the boards are properly connected each-others. Use eCUBE DVP exclusively with Power Supply unit supplied in the box. V3H Starter Kit shall not be powered with standalone power source in addition to power supply connected to eCUBE DVP.

Register now your product on https://www.lacroix-impulse.com/ecube-registrer website and download free of charge firmware for eCUBE DVP.

2- Overview

eCUBE DVP is a mother board designed and manufactured by LACROIX Impulse to extend the functionalities of Renesas R-Car V3x starter kit. It enables plugin two cameras thanks to the two FAKRA connectors and display frame buffer on a HDMI screen connected to the board. Typical use of eCUBE DVP is cameras frames streaming with frames sending to Customer application or a third-party perception stack then rending camera frames on HDMI display with graphics information blended on camera frames.

Dedicated firmware for eCUBE DVP enables LI-IMX390-GMSL2 camera and LI-AR0220-GMSL2 camera commercialized by Leopard Imaging company (https://www.leopardimaging.com) as well as the onboard HDMI transmitter. Cameras and display shall be purchased separately from this development platform. Sample application is delivered in source code to help Customer kickstarting its own development.
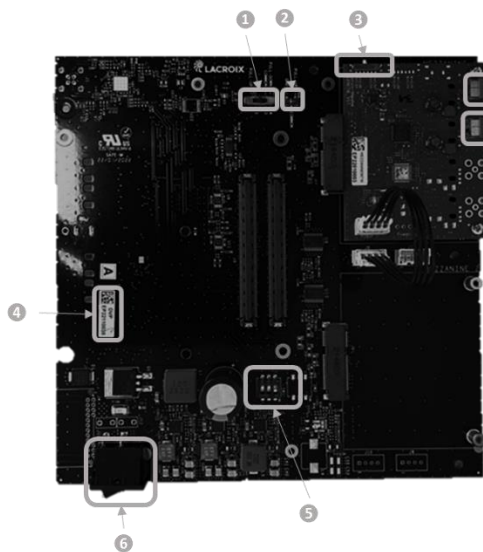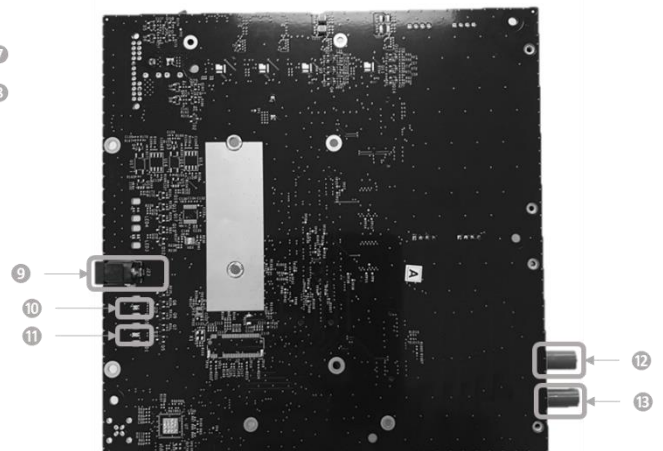
3- eCUBE DVP Hardware

Figure 1: TOP view

Figure 2: BOTTOM view

❶ V3HSK auto-power on switch 1
❷ V3HSK auto-power on switch 2
❸ Mezzanine board I2C address
❹ Product ID serial number
❺ Power over coax voltage setting (5V, 9V, 11V, 12V)
❻ Power ON/OFF switch
❼ FAKRA Port 0 (AR0220 camera plugin)
❽ FAKRA Port 1 (IMX390 camera plugin)

❾ Power Supply connector (DC 24V 2.5A)
❿ FAKRA PoC power voltage LED
⓫ FAKRA Power supply LED
⓬ FAKRA Port 1 LED
⓭ FAKRA Port 0 LED

4- Switches position and LED indicators

SWITCH	CONFIGURATION	DESCRIPTION
❺	1:OFF 2:OFF 3:OFF	5V cameras connected to FAKRA Ports
❺	1:OFF 2:OFF 3:ON	9V cameras connected to FAKRA Ports
❺	1:OFF 2:ON 3:OFF	11V cameras connected to FAKRA Ports
❺	1:ON 2:OFF 3:OFF	12V cameras connected to FAKRA Ports
❶	PU	Reserved future use
❶	NC	Keep switch this position
❶	PD	Reserved future use
❷	GND	Keep switch this position
❷	PU	Reserved future use

LED	COLOR	DESCRIPTION
❿	OFF	Power supply voltage set to 5V on FAKRA Ports
❿	GREEN	Power supply voltage set to 9V on FAKRA Ports
❿	YELLOW	Power supply voltage set to 11V on FAKRA Ports
❿	RED	Power supply voltage set to 12V on FAKRA Ports
⑪	OFF	VCAM1 not enabled and no power delivered to mezzanine boards
⑪	GREEN	VCAM1 enabled and power delivered to mezzanine boards
⑫	OFF	No power over coax delivered on FAKRA Port 1
⑫	GREEN	Power over coax delivered on FAKRA Port 1
⑬	OFF	No power over coax delivered on FAKRA Port 0
⑬	GREEN	Power over coax delivered on FAKRA Port 0

5- V3HSK Installation

Take the V3HSK ① and remove glass and the standoffs at the bottom side ②. Replace the 4 standoffs on the V3HSK bottom side with standoffs delivered with eCUBE DVP board ③.


Take the eCUBE DVP ④ and remove the glass at the bottom side ⑤⑥.
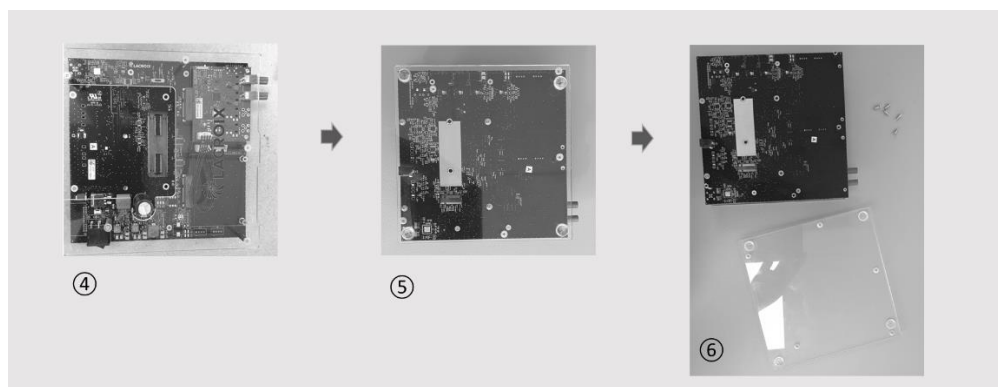
Insert the V3HSK ⑧ inside the eCUBE DVP ⑦. This step must be done with care to avoid damaging the board to boards connectors and to avoid bending the eCUBE DVP board PCB during the plugin operation. It is recommended to hold the

two boards in sandwich between both hands placed left side and right side of the V3HSK and below the eCUBE main board PCB to compensate insertion effort by sustaining the eCUBE DVP main board underneath during insertion effort.
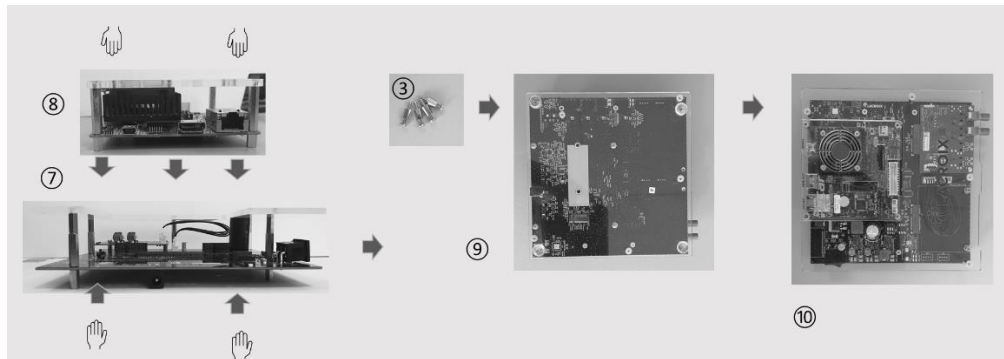
Use the 4 screws ③ delivered with eCUBE DVP to screw V3HSK with eCUBE DVP main board then re-place the bottom glass ⑨ on eCUBE DVP bottom side. Your eCUBE DVP ⑩ is now ready to use.

6- eCUBE DVP powering up

Connect the Power Supply Unit ⑫ provided with the eCUBE DVP to connector ❾ and switch on the board thanks to the power switch ❻. The V3HSK automatically boots and it is possible to get the console via a USB cable connected to V3HSK mini-USB connector.
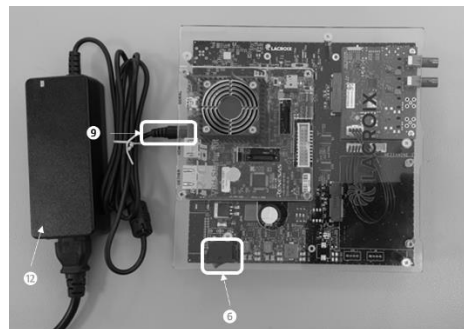
7- Downloading and flashing the firmware

eCUBE DVP firmware is made available for download on SFTP server after Customer has registered its product on LACROIX Impulse website. The procedure for flashing the firmware is indicated as part of the firmware documentation. The firmware is composed of eVIEW firmware running on Cortex R7, MFIS and eVIEW_ITF Linux components, the sample application, the eTUNE Wrapper and eVISION LSC AE/AWB library.
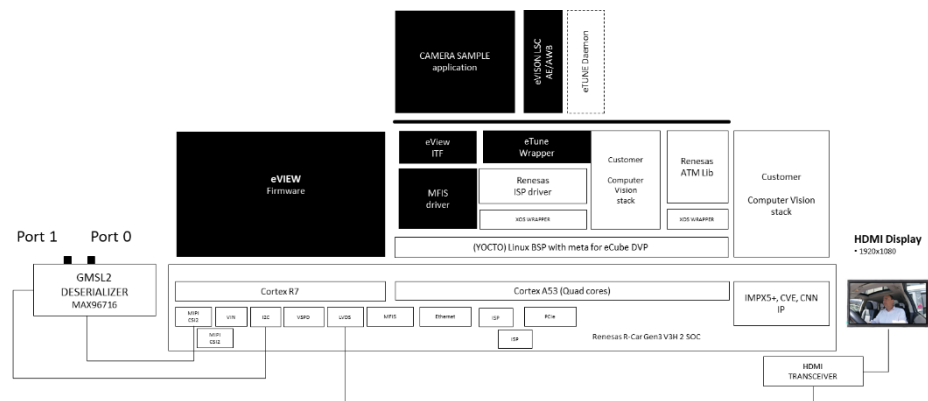
eVIEW firmware controls the cameras, the GMSL2 serializers, the GMSL2 deserializer and the HDMI transceiver. MFIS and eVIEW_ITF expose high level API to the sample application which subscribes cameras and retrieves RAW frames from these cameras, and it can retrieve a streamer to send RGB888 data to display frame buffer. eTUNE wrapper sits on top of Renesas ISP driver library and it allows to convert RAW frames into RGB888 frames with ISP tuning configured according to the sensor. eVISION LSC AE/AWB is a library called by the sample application to automatically manage integration time of the sensor according to the scene luminosity and to compensate changes in light color temperature.

Firmware is delivered together with Yocto Linux R-Car V3H and meta for eCUBE DVP as well as Renesas libraries. Customer must have a valid Evaluation License Agreement in place with Renesas to get access to Renesas libraries.

eTUNE daemon component is a connector to ISP tuning tool and ISP calibration tool. Component is not part of the deliverables, but it can be purchased separately by contacting LACROIX Impulse in the case Customer wants to realize its own ISP tuning on camera RAW frames.

8- Warranty

Please check when opening the box that development platform is functional as development platforms are not warrantied. In case material is damaged, please contact LACROIX Impulse technical support.

9- Technical support

LACROIX Impulse engineering team is working closely with Renesas teams. Technical support and engineering services can be purchased by contacting LACROIX Impulse. Portfolio of the engineering services proposed by LACROIX Impulse include custom camera driver implementation as well as specific ISP tuning according to Customer KPI.

Please send email to platforms.impulse@lacroix.group for technical support.

10- Upgrading eCUBE DVP

In case more camera inputs are needed, it is possible to populate the second mezzanine board slot with a mezzanine board. In total, the power delivery over coax cannot exceed 2A in total for all camera inputs. It is also possible to replace the legacy mezzanine populated on first slot by another mezzanine type. Mezzanine boards can be purchased separately by contacting LACROIX Impulse and a specific firmware is required to activate them:

- FPDLINKIII DS90UB960 (4 camera inputs, 300mA@ 12V)
- GMSL MAX9286 (4 camera inputs, 300mA@12V)
- GMSL2 MAX96716 (2 camera inputs, 900mA@12V)

PCIe functionality (M.2 NVME slot 2280 Key M) can be populated on eCUBE DVP board to extend the V3H starter kit functionality. This operation requires the board to be shipped to LACROIX Impulse.

11- Electrical schematics
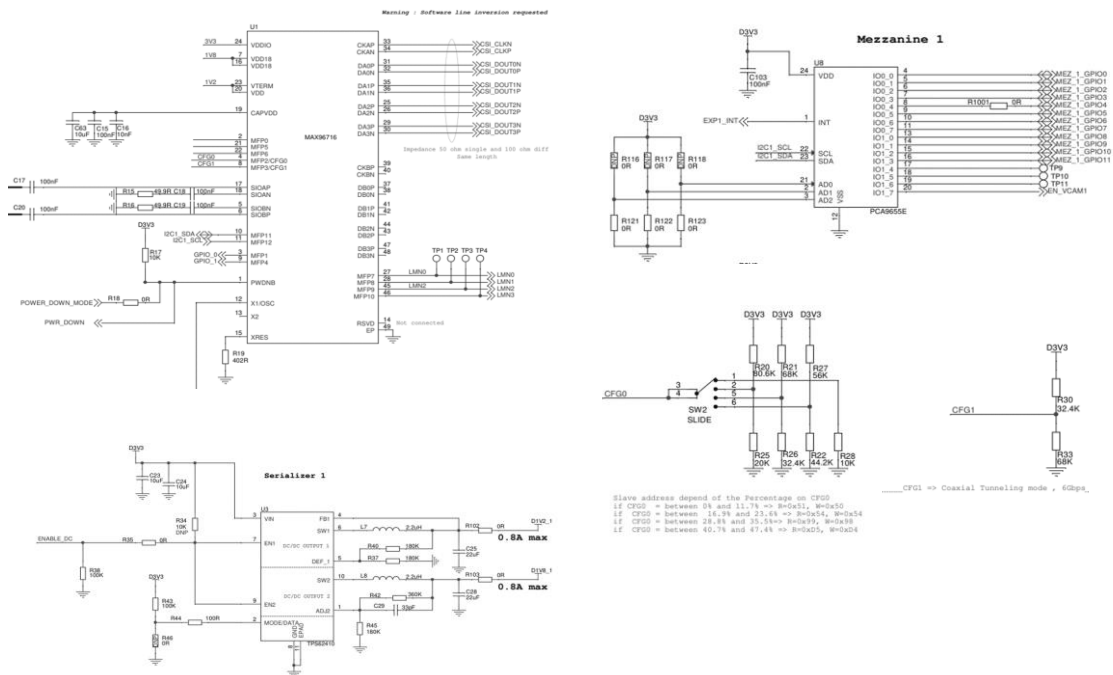
V3HSK COM Express 440pins		eCUBE DVP signal		eCUBE main board signal	eCUBE mezzanine board signal
D102	GP4_02_33	I2C1_SCL		MEZ_1_GPIO0	ON_CAM_1
B57	GP2_28_DU	I2C1_SDA		MEZ_1_GPIO1	ON_CAM_2
C10	GP2_06_VIN01	EXP1_INT		MEZ_1_GPIO4	GPIO_0 (MFP1)
C62	CSI0_CLKN_18	CSI_CLKN		MEZ_1_GPIO5	GPIO_1 (MFP4)
C61	CSI0_CLKP_18	CSI_CLKP		MEZ_1_GPIO7	POWER_DOWN_MODE
C65	CSI0_DOUT0P_18	CSI_DOUT0P		MEZ_1_GPIO10	ENABLE_DC
C66	CSI0_DOUT0N_18	CSI_DOUT0N			
C68	CSI0_DOUT1P_18	CSI_DOUT1P			
C71	CSI0_DOUT1N_18	CSI_DOUT1N			
C72	CSI0_DOUT2P_18	CSI_DOUT2P			
C74	CSI0_DOUT2N_18	CSI_DOUT2N			
C75	CSI0_DOUT3P_18	CSI_DOUT3P			
C78	CSI0_DOUT3N_18	CSI_DOUT3N			
C10	GP2_06_VIN01	EXP1_INT			

ON_CAM_1:   Switch on power over coax for FAKRA Port 0 (ENABLE_DC to be set to 1)
ON_CAM_2:   Switch on power over coax for FAKRA Port 1 (ENABLE_DC to be set to 1)
ENABLE_DC: General switch on power over coax for mezzanine 1

13- Known limitations

Auto-power on is not functional when eCUBE DVP used with Y-ASK-RCAR-V3H-WS11-REV2, Y-ASK-RCARD-V3H-WS20 ⌄ User must press the V3H starter kit power button to get the board powering up.

If you need technical support, do not hesitate to contact us : platforms.impulse@lacroix.group