User's Manual

ADAS Surround View Kit

User's Manual: Hardware

Surround view application board (for ADAS Starter Kit)

Renesas Electronics
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1. Handling of Unused Pins

   Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.
   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

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   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

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How to Use This Manual

1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the hardware functions and electrical characteristics of the ADAS Surround View Kit. It is intended for users designing application systems incorporating the ADAS Surround View Kit. A basic knowledge of electric circuits, logical circuits, and SoCs is necessary in order to use this manual.

The manual comprises an overview of the product; descriptions of the components, control functions, peripheral functions, and electrical characteristics; and usage notes.

> The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

The following documents apply to the ADAS Starter Kit product group. Make sure to refer to the latest versions of these documents. The newest versions of the documents listed may be obtained from the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
User's manual for Hardware	Hardware specifications (pin assignments, peripheral function specifications, electrical characteristics) and operation description	ADAS Surround View Kit User's Manual: Hardware	This User's manual
User's manual for Hardware	Hardware specifications (pin assignments, peripheral function specifications, electrical characteristics) and operation description	The ADAS Starter Kit R-Car H2	R20UH0001ED0000
Renesas Technical Update	Product specifications, updates on documents, etc.	Available from Renesas Electronics Web site.	

2. List of Abbreviations and Acronyms

Abbreviation	Full Form
GMSL	Maxim's Gigabit Multimedia Serial Link technology
PoC	Power-over-Coax; a means of supplying a unit, here a camera or a display, over the same line as used for the data transfer
FAKRA	The German abbreviation "Fachkreis Automobil", meaning "Automobile Expert Group"; Here: a type of coaxial connector
ITU-R BT.656	A digital video protocol
YCbCr-422 (UYVY)	Digital video format: YCbCr is the encoding scheme (Y being luma, Cb and Cr the blue and red difference chroma components); 422 is the subsampling of the YCbCr components; UYVY is the stream byte sequence, here Cb Y0 Cr Y1
CoM Express	Computer-on-Module; a form-factor and connector definition, originally released by the PCI Industrial Computer Manufacturers Group (PICMG)
I2C	Inter-Integrated-Circuit serial bus
CAN	Controller Area Network serial bus
AVB	Audio-Video-Bridging extensions to Ethernet
MAC	Media access control; the lower sublayer of the data link layer (layer 2) of the seven-layer OSI model
PHY	The circuitry required to implement PHYsical layer of the OSI model
GMII, RGMII	(Reduced) Gigabit Media-Independent Interface; the interface between a MAC and a PHY
1000Base-T	A standard for Gigabit Ethernet over copper wiring
U-Boot	Universal Bootloader; an open source, primary boot loader used in embedded devices to package the instructions to boot the device's operating system kernel

Table of Contents

1. Introduction

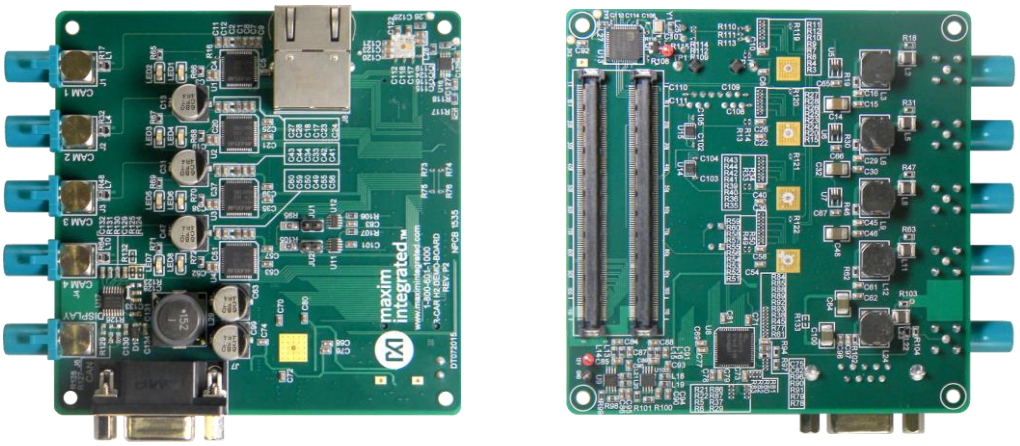


Figure 1-1: ADAS Surround View Kit PCB view top / bottom

1.1 General Function

The ADAS Surround View Kit add-on board is designed to support development of an automotive surround-view camera system.

It can be used to connect to peripherals required for capturing video data.

The ADAS Surround View Kit add-on board cannot be used stand-alone. It is intended to be used in combination with the ADAS Starter Kit.

1.2 Interfaces

The interfaces that are available on the board allow to connect the following units:

- 4 identical cameras with GMSL interface, supplied by PoC (power-over-coax)
- Gigabit Ethernet with support for AVB (audio-video-bridging)
- CAN, 2 channels, rev 2.0B, 1Mbps
- a display with GMSL interface, supplied by PoC (power-over-coax)
- ADAS Starter Kit board

1.3 Environment

Operating ambient temperature: 0°C to 40°C. Do not expose to condensation.

1.4 Block Diagram

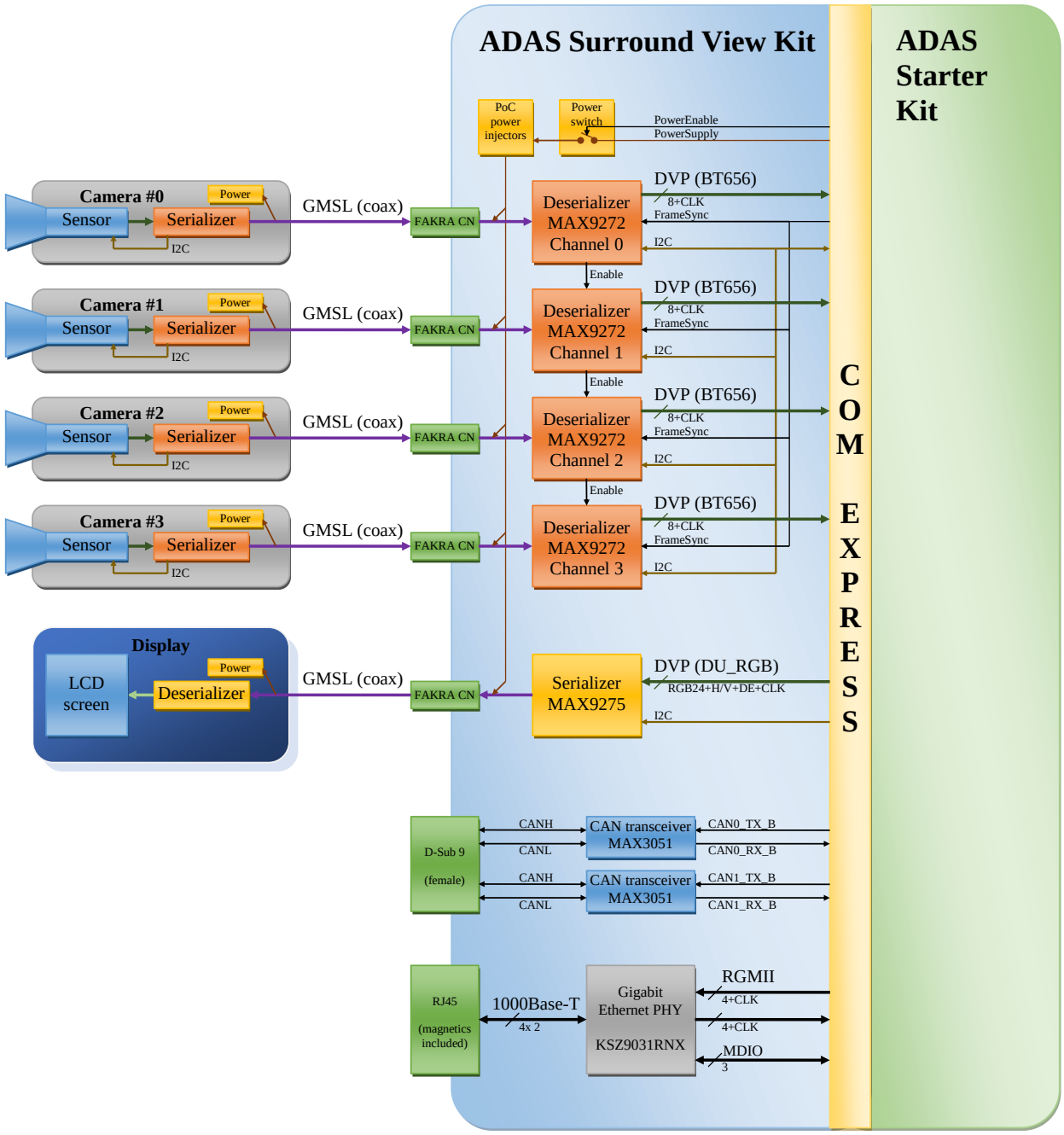


Figure 1-2: System Block Diagram

2. Connectors, Jumpers and LEDs

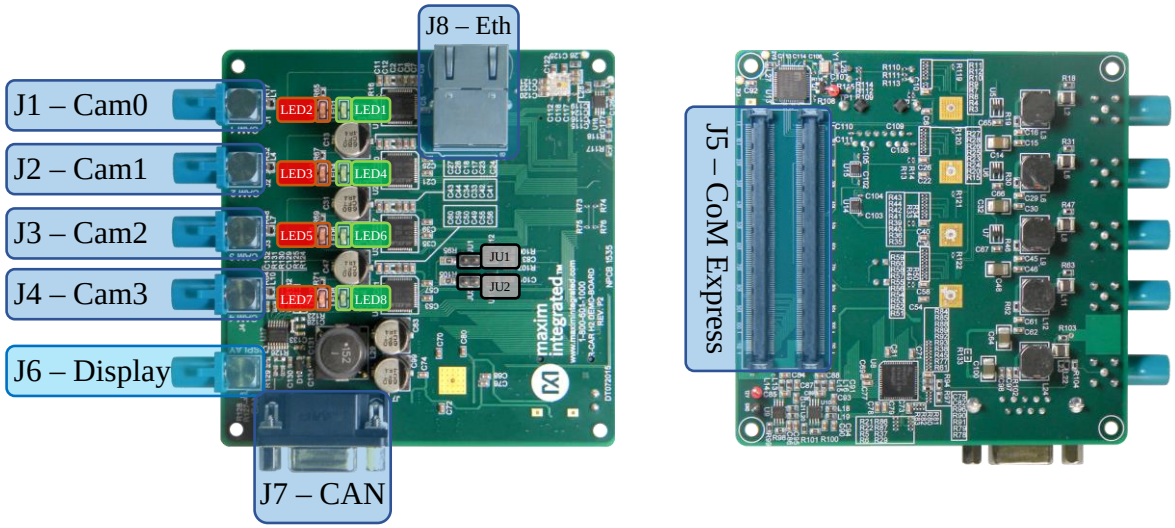


Table 2-1: Connectors

Connector	Type	Function
J1	FAKRA	Cam0 / VIN0 input, GMSL
J2	FAKRA	Cam1 / VIN1 input, GMSL
J3	FAKRA	Cam2 / VIN2 input, GMSL
J4	FAKRA	Cam3 / VIN3 input, GMSL
J5	CoM Express (TE 3-1827231-6)	ADAS Starter Kit
J6	FAKRA	Display output, GMSL
J7	D-Sub 9, female	CAN interfaces (2 channels)
J8	RJ45	Gigabit Ethernet

Table 2-2: LEDs

LED	Color	Function
LED1	Green	Deserializer 0 – Lock
LED2	Red	Deserializer 0 – Error
LED4	Green	Deserializer 1 – Lock
LED3	Red	Deserializer 1 – Error
LED6	Green	Deserializer 2 – Lock
LED5	Red	Deserializer 2 – Error
LED8	Green	Deserializer 3 – Lock
LED7	Red	Deserializer 3 – Error

Table 2-3: Jumpers

Jumper	Function
JU1	CAN channel 0 termination
JU2	CAN channel 1 termination

3. Power Supply

The ADAS Surround View Kit board is supplied from the ADAS Starter Kit via the CoM Express connector.

The peripheral supply rails for 3.3V and 2.5V are supplied from regulators on the ADAS Starter Kit board.

The peripheral supply rails for 1.8V and 1.2V are supplied from regulators on the ADAS Surround View Kit board, derived from 3.3V.

The cameras and the display are supplied via PoC (power-over-coax).

The supply is injected using this type of filter:

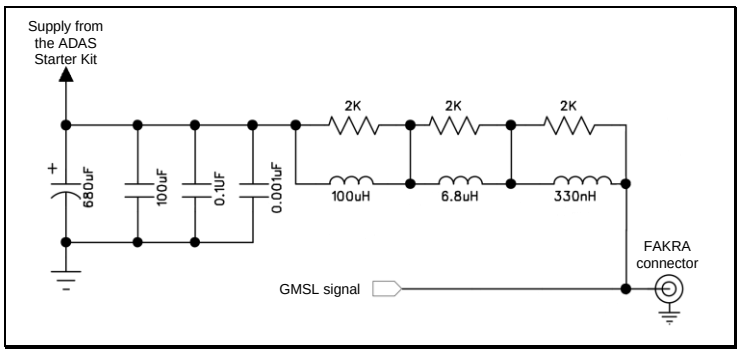


Figure 3-1: PoC filter

Take care, as the supply is not fused.

The voltage level and maximum available current depend on the power supply used for the ADAS Starter Kit, as the power is connected directly from the power supply input to the PoC filter.

The power unit supplied with the ADAS Starter Kit board is able to provide 1.2A at 15V.

If the power is not sufficient to supply all cameras and the optional display, a different power supply needs to be attached to the ADAS Starter Kit.

A 15V/2A power unit is provided with the ADAS Surround View Kit package.

4. Camera Deserializers

The board has four MAX9272 GMSL deserializers as video inputs for cameras.

Each deserializer connects to one camera via a coax connection.

4.1 Configuration Strapping

The hardware configuration strapping of the deserializers is as follows:

Pin	Function	Level	Setting
Pin 3	CX / TP	H	Coax operation, I2C slave address 0x90/91
Pin 5	LCCEN	H	Use local control-channel (I2C)
Pin 4	I2CSEL	H	Use I2C interface
Pin 47	MS	L	Base mode (for I2C)

Table 4-1: MAX9272 configuration strapping

4.2 I2C as Local Control Channel

The deserializers can be configured using I2C.

By default, all four deserializers are connected to I2C channel 1 of R-Car H2.

The corresponding serializers and sensor units may be configured via the configuration channel of the GMSL interface, also via I2C.

4.3 Cascading

The deserializers' GPIOs are allocated as follows:

Pin	Function	Level	Setting
Pin 2	GP0	(output)	Used to cascade deserializers; connects to PWDNZ of next deserializer (see below).
Pin 9	GPI	(input)	Used for FrameSync, to frame-synchronize the four cameras, if they support this. All deserializers connect to the same (GPIO) output of the ADAS Starter Kit.
Pin 1	GP1	L	Unused

Table 4-2: MAX9272 GPIO/cascading

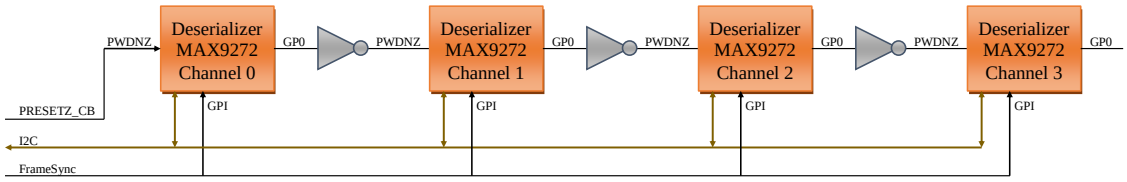


Figure 4-1: Cascading of Deserializers

PWDNZ (Pin 13) of the first deserializer is connected to PRESETZ_CB output of the ADAS Starter Kit board. A hardware reset will reset the first deserializer.

PWDNZ (Pin 13) of the following deserializers are connected to the previous desializers' outputs GP0.

This cascading is needed to be able to configure all deserializers via I2C.

After initial reset, only the first deserializer is available on the I2C bus, at I2C address 0x90/91. Its I2C slave address needs to be reconfigured. After that it can release the next deserializer. The next deserializer's initial address is 0x90/91 again. This procedure needs to be repeated until all deserializers are activated and accessible on unique addresses.

When selecting addresses for the deserializers, serializers and sensors, please keep in mind that there are other devices on this bus.

By default, only the PMIC device DA9063 on the ADAS Starter Kit is connected to I2C channel 1. It has the power-up addresses 0xB4/B5/B6/B7, but may have been re-configured, depending on the application software.

4.4 Channel Allocation

The camera input channels are allocated like this:

CN	Channel	View
J1	Cam0 / VIN0	Rear
J2	Cam1 / VIN1	Front
J3	Cam2 / VIN2	Right
J4	Cam3 / VIN3	left

Table 4-3: Camera channel physical locations

The allocation for rear/front/right/left is arbitrary but needs to match the software application. They may be changed. At time of delivery, the cameras mounted on the carrier board have this connection sequence.

4.5 Video Mode

R-Car H2 supports simultaneous input of four video streams only when using ITU-R BT.656 mode, single edge, 8 bits, YCbCr-422 (UYVY).

The camera needs to support this output mode.

The ADAS Surround View Kit was designed to work in combination with a camera using a MAX9271 serializer and an OmniVision OV10635 sensor. Other sensors or serializers may be work, but are not guaranteed.

The OV10635 sensor can output data in 10-bit or in 8-bit mode. As the 8-bit mode outputs the data on the data signals D9 to D2 (and not D7 to D0), the video input of the ADAS Starter Kit is connected to DOUT[9:2] of the MAX9272 deserializer. All other DOUT signals are not connected.

4.6 Signal Mapping

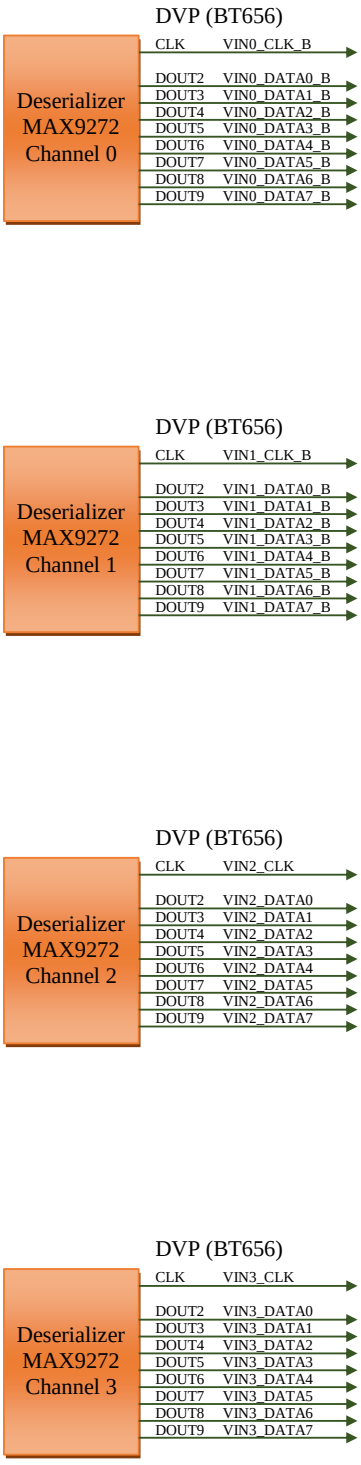
The parallel outputs connect to the four video inputs of the ADAS Starter Kit board.

Every channel has a clock signal and eight data lines.

The mapping of the DIN signals is as follows:

Table 4-4: Video Input Signals

Serializer	VIN	GPIO	CoM Express
PCLKOUT	VIN0_CLK_B	GP3_14	D23
DOUT2	VIN0_DATA0_B	GP3_16	C15
DOUT3	VIN0_DATA1_B	GP3_17	C16
DOUT4	VIN0_DATA2_B	GP3_18	C17
DOUT5	VIN0_DATA3_B	GP3_19	C18
DOUT6	VIN0_DATA4_B	GP3_20	C19
DOUT7	VIN0_DATA5_B	GP3_21	C20
DOUT8	VIN0_DATA6_B	GP3_22	C22
DOUT9	VIN0_DATA7_B	GP3_23	C23
PCLKOUT	VIN1_CLK_B	GP3_15	D39
DOUT2	VIN1_DATA0_B	GP3_00	C27
DOUT3	VIN1_DATA1_B	GP3_01	C28
DOUT4	VIN1_DATA2_B	GP3_02	C29
DOUT5	VIN1_DATA3_B	GP3_03	C30
DOUT6	VIN1_DATA4_B	GP3_04	D28
DOUT7	VIN1_DATA5_B	GP3_05	C32
DOUT8	VIN1_DATA6_B	GP3_06	C33
DOUT9	VIN1_DATA7_B	GP3_07	C34
PCLKOUT	VIN2_CLK	GP1_11	D49
DOUT2	VIN2_DATA0	GP0_08	C42
DOUT3	VIN2_DATA1	GP0_09	C43
DOUT4	VIN2_DATA2	GP0_10	C44
DOUT5	VIN2_DATA3	GP0_11	C45
DOUT6	VIN2_DATA4	GP0_12	C46
DOUT7	VIN2_DATA5	GP0_13	C47
DOUT8	VIN2_DATA6	GP0_14	C48
DOUT9	VIN2_DATA7	GP0_15	C49
PCLKOUT	VIN3_CLK	GP1_23	D59
DOUT2	VIN3_DATA0	GP0_00	C52
DOUT3	VIN3_DATA1	GP0_01	C53
DOUT4	VIN3_DATA2	GP0_02	C54
DOUT5	VIN3_DATA3	GP0_03	C55
DOUT6	VIN3_DATA4	GP0_04	C56
DOUT7	VIN3_DATA5	GP0_05	C57
DOUT8	VIN3_DATA6	GP0_06	C58
DOUT9	VIN3_DATA7	GP0_07	C59



4.7 Pin Multiplexing

Please note that due to pin function sharing of the R-Car H2 device, some functions are not available if the VideoIn channels are used.

See the below table for shared functions.

Accordingly, the pin multiplexing on the ADAS Starter Kit needs to be configured using the CPLD. Refer to the ADAS Starter Kit manual and support software for details.

You can configure the multiplexers e.g. at boot time via U-Boot:

```
cpld write 0x01 0x4966
```

or using the OS with an equivalent of:

```
echo -n vin0_bt656_state > /sys/devices/mux.7/state  (default)
echo -n vin1_bt656_state > /sys/devices/mux.8/state
echo -n vin2_bt656_state > /sys/devices/mux.9/state  (default)
echo -n vin3_bt656_state > /sys/devices/mux.10/state
```

Bit	Bit = 0	Bit = 1
12	vin0_bt656_state*	sdhi2_state
11	sdhi0_state*	vin1_bt656_state
1	avb_state	vin2_bt656_state*
8	irq3_state*	vin3_bt656_state

*=default

5. LEDs

The 8 LEDs on the ADAS Surround View Kit board reflect the status of the four deserializers.

Two LEDs are connected to the outputs LOCK and ERRZ of each MAX9272.

Table 5-1: LEDs

LED	Color	State	Meaning
LOCK	Green	On	• GMSL link OK (PLLs locked with correct serial-word-boundary alignment) • but also when the deserializer is in power-down mode
		Off	• No GMSL link (PLLs not locked or incorrect serial-word-boundary alignment) • or only a configuration link established • or during PRBS test
ERRZ	Red	On	• data error detected and/or corrected
		Off	• no errors detected • or no GMSL link established

6. Example Initialization Sequence

This chapter shows an example initialization sequence for deserializers, serializers and camera sensors.

Note:

The cameras, therefore their sensors and serializers, the display and its deserializer are not connected to the ADAS Starter Kit/ADAS Surround View Kit's RESETZ signal.

If you are warm-booting a system, or returning from a power-save mode, the units may still be in a configured state and not in the power-up default state.

Similarly, the deserializers' configuration may survive a warm-boot, depending on the application.

Your software should consider this and either tolerate a pre-configured system, or be prepared to clear an existing configuration by software, before starting a new configuration cycle.

Alternatively, you can power-cycle the cameras with the power switch on ADAS Surround View Kit.

- Optionally, but not mandatory, power-cycle the camera modules, to reset them to power-on defaults. Depending on the camera modules and capacitance in the power supplies, the cycling may require some time
- Optionally, clear existing configuration of camera deserializers from prior run
- Optionally, clear existing configuration of display serializer from prior run
- Optionally, configure new I2C address for display serializer
- for each channel:
    - configure a new I2C address for the deserializer
    - configure the deserializer
    - establish a configuration link; configure transmitter and receiver according to PoC (power-over-coax) requirements
    - optionally, clear existing configuration of camera serializer from prior run
    - initialize camera serializer
    - optionally, if required by the camera design, release the sensor's RESETZ (connected to a GPIO pin of the serializer)
    - optionally, perform a software-reset of the camera sensor
    - configure new I2C address for camera sensor, or configure corresponding I2C address translation by the de/serializer
    - configure new I2C address for camera serializer, or configure corresponding I2C address translation by the de/serializer
    - configure the camera sensor
    - switch from configuration link to GMSL link
    - set deserializer's GP0 output to L to release next cascaded deserializer and repeat the procedure until all four channels have been configured

For a more detailed configuration process, please consult the documentation of the deserializers, serializers and sensors available from corresponding the manufacturers.

Please note that initialization for power-over-coax systems (as ADAS Surround View Kit) requires additional steps on the de/serializers.

7. Camera Synchronization (optional)

If it is required by the application, the four cameras may be synchronized.

The deserializers share one signal intended to be used as a "frame sync" trigger. It connects to the deserializers' GPI pin.

It is output to the serializers GPO pins.

The frame sync signal originates at GP0_17 of the R-Car H2 device (CoM Express A44).

If this feature is not needed, the GPIO pin may be left unconfigured.

8. Camera Power Switch

The cameras are directly supplied from the ADAS Starter Kit board.

If the application needs to place the system in a low-power state, or if the application needs to power-cycle the camera modules, it can do this using a power switch available on the ADAS Surround View Kit board.

By default the cameras are in the off state.

Configuring the allocated GP0_16 pin of the R-Car H2 device (CoM Express A43) to H turns on the camera supply.

The SHDNZ input of the power switch has a pull-down, so by default the cameras are not powered. Unless GP0_16 is driven H, the cameras will remain unpowered and will not respond.

9. Display Serializer

The board has a MAX9275 GMSL serializer for video output to a display.

The serializer uses the parallel DU_RGB output of ADAS Starter Kit. The display unit is the same that generates the image output to the HDMI connector of the ADAS Starter Kit board.

Simultaneous operation may be possible, but depends on the image bandwidth (resolution and frame rate).

9.1 Configuration Strapping

The hardware configuration strapping of the serializer is as follows:

Pin	Function	Level	Setting
Pin 29	PWDNZ	H	Always in power-up mode
Pin 40	CONF0	L	I2CSEL=1: Use I2C interface
Pin 32	CONF1	MID	SSEN=0: disable spread spectrum DRS=0: High rate
Pin 41	CONF2	L	CX/TP=1: coax operation
Pin 25	CONF3	MID	AUTOSZ=0: autostart ES=0: PCLK rising edge latch
Pin 42	BWS	H	Bus width 32-bit
Pin 27	MS	L	Base mode (for I2C)

Table 9-1: MAX9275 configuration strapping

9.2 I2C as Local Control Channel

The serializer can be configured using I2C.

By default, it is connected to I2C channel 2 of R-Car H2.

The corresponding deserializer may be configured via the configuration channel of the GMSL interface, also via I2C.

The power-up I2C address is 0x80/81. Its I2C slave address may be reconfigured.

When selecting addresses for the serializer and deserializer, please keep in mind that there are other devices on this bus.

By default, only the HDMI transmitter ADV7511 on the ADAS Starter Kit is connected to I2C channel 2. It has the power-up addresses 0x70/71/72/73/78/79/7C/7D/7E/7F, but may have been re-configured, depending on the application software.

9.3 Signal Mapping

The mapping of the DIN signals is as follows:

Table 9-2: Video Output Signals

Serializer	DU_RGB	GPIO	CoM Express
PCLKIN	DU_DOTCLKOUT0	GP5_02	D101
DIN0	DU_DR0	GP4_28	C082
DIN1	DU_DR1	GP4_29	C083
DIN2	DU_DR2	GP4_16	C085
DIN3	DU_DR3	GP4_17	C086
DIN4	DU_DR4	GP4_18	C088
DIN5	DU_DR5	GP4_19	C089
DIN6	DU_DR6	GP4_20	C091
DIN7	DU_DR7	GP4_21	C092
DIN8	DU_DG0	GP4_31	D085
DIN9	DU_DG1	GP5_01	D086
DIN10	DU_DG2	GP4_27	D088
DIN11	DU_DG3	GP4_30	D089
DIN12	DU_DG4	GP5_07	D091
DIN13	DU_DG5	GP5_14	D092
DIN14	DU_DG6	GP5_15	D094
DIN15	DU_DG7	GP5_04	D095
DIN16	DU_DB0	GP5_05	C094
DIN17	DU_DB1	GP5_06	C095
DIN18	DU_HSYNC	GP5_14	D097
DIN19	DU_VSYNC	GP5_15	D098
DIN20	DU_DISP	GP5_16	D099
DIN21	DU_DB2	GP5_08	C097
DIN22	DU_DB3	GP5_09	C098
DIN23	DU_DB4	GP5_10	C099
DIN24	DU_DB5	GP5_11	C101
DIN25	DU_DB6	GP5_12	D082
DIN26	DU_DB7	GP5_13	D083

The I2S/TDM audio input is not used (pins 22/23/24, SD/SCK/WS).

10. I2C Interface

The deserializers and serializer are connected to the I2C channels of the ADAS Starter Kit.

The I2C channels are allocated to the following pins of R-Car H2:

Table 10-1: I2C Signals

Signal	GPIO	CoM Express
I2C_SCL1	GP1_16	C40
I2C_SDA1	GP1_17	D40
I2C_SCL2	GP4_00	C50
I2C_SDA2	GP4_01	D50

The pull-up resistors for the open-drain operation are located on the ADAS Starter Kit only.

The interfaces can operate at 100 kHz, according to the specification of the ADAS Starter Kit.

11. CAN Interface

The ADAS Surround View Kit supports two CAN channels.

R-Car H2 complies to CAN rev 2.0B, at 1Mbps.

The transceivers used on the ADAS Surround View Kit are MAX3051.

The CAN channels are allocated to the following pins of R-Car H2:

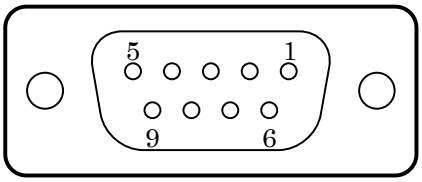
Table 11-1: CAN Signals (at CoM Express connector)

Signal	GPIO	CoM Express
CAN0_TX_B	GP4_04	B98
CAN0_RX_B	GP4_05	B99
CAN1_TX_B	GP4_06	B19
CAN1_RX_B	GP4_07	B20

The channels are available on the female D-Sub 9 connector J7. Its pinout is as follows:

Table 11-2: CAN Signals (at Sub-D 9 connector)

Pin	Signal
1	CANL, channel 1
2	CANL, channel 0
3	GND
4	NC
5	GND
6	GND
7	CANH, channel 0
8	CANH, channel 1
9	NC



If required, the channels can be terminated with 120 Ohm by closing the corresponding jumpers:

Table 11-3: CAN termination

Jumper	Function
JU1	CAN channel 0 termination
JU2	CAN channel 1 termination

Setting	Function
Open	No termination
Closed	120 Ohm termination

12. Gigabit Ethernet

R-Car H2 supports one Gigabit Ethernet MAC with AVB extension.

On the ADAS Starter Kit there is a converter from GMII to RGMII.

On the ADAS Surround View Kit a PHY, KSZ9031RNX, converts to 1000Base-T.

As the ADAS Starter Kit only supports 1000 Mbps (but not 100 Mbps or 10 Mbps), the RJ45 connector (J8) on the ADAS Surround View Kit needs to be connected to a 1000 Mbps capable counterpart.

The PHY's RESETZ pin is connected to PRESETZ_CB output of the ADAS Starter Kit board. A hardware reset of ADAS Starter Kit will reset the PHY.

The hardware configuration strapping of the PHY is as follows:

Pin	Function	Level	Setting
Pin 17	PHYAD0 (LED1)	H	PHYADDR[4:0] = 00111 = 0x07
Pin 15	PHYAD1 (LED2)	H	
Pin 35	PHYAD2 (RX_CLK)	H (by ADAS Starter Kit)	
Pin 27	MODE3 (RXD3)	H (by ADAS Starter Kit)	MODE[3:0] = 1101 = 0xD = RGMII mode; advertise 1000Base-T full- and half-duplex only
Pin 28	MODE2 (RXD2)	H (by ADAS Starter Kit)	
Pin 31	MODE1 (RXD1)	L (by ADAS Starter Kit)	
Pin 32	MODE0 (RXD0)	H (by ADAS Starter Kit)	
Pin 33	CLK125_EN (RX_DV)	L (by ADAS Starter Kit)	Disable 125MHz clock output
Pin 41	LED_MODE (CLK125_NDO)	Open	(LED mode can be set by software via MDIO)

Table 12-1: MAX9272 configuration strapping

The RGMII interface (2.5V) is connected to the following pins:

Table 12-2: RGMII Signals

Signal	CoM Express
RGMII_TXC	B14
RGMII_TD0	B9
RGMII_TD1	B10
RGMII_TD2	B12
RGMII_TD3	B13
RGMII_TX_CTL	B15
RGMII_RXC	B7
RGMII_RD0	B3
RGMII_RD1	B4
RGMII_RD2	B5
RGMII_RD3	B6
RGMII_RX_CTL	B8

The PHY's management interface is connected to the following pins:

Table 12-3: MDIO Signals

Signal	GPIO	CoM Express
AVB_MDC	GP2_11	B17
AVB_MDIO	GP2_12	B16
AVB_PHY_INT	GP2_15	B2

The RJ45 connector has two integrated LEDs:

Color	Meaning	Level	At PHY pin / signal	Function (single-LED mode)	Function (tri-color dual-LED mode)	LED
Yellow	Activity	low-active	Pin 17 / LED1	Activity	always off	LED1
Green	Link	low-active	Pin 15 / LED2	Link	Link(on) / Activity(blinking)	LED2

12.1 Pin Multiplexing

Please note that due to pin function sharing of the R-Car H2 device, the Gigabit Ethernet interface is not available if the VideoIn channel 2 is used.

Accordingly, the pin multiplexing on the ADAS Starter Kit needs to be configured using the CPLD. Refer to the ADAS Starter Kit manual and support software for details.

You can configure the multiplexer e.g. at boot time via U-Boot:

```
cpld write 0x01 0x4060
```

or using the OS with an equivalent of:

```
echo -n avb_state > /sys/devices/mux.9/state
```

Bit	Bit = 0	Bit = 1
1	avb_state	vin2_bt656_state*

*=default

13. Limitations on SDHI0/2 (SD Host Interfaces)

Please note that due to pin function sharing of the R-Car H2 device, the SDHI0 interface is not available if the VideoIn channel 1 is used.

Equally, the SDHI2 interface is not available if the VideoIn channel 0 is used.

If one or both of these interfaces is/are required, the corresponding video inputs cannot be used.

Also the pin multiplexing on the ADAS Starter Kit needs to be configured using the CPLD.

You can configure the multiplexer e.g. at boot time via U-Boot:

```
cpld write 0x01 0x4062
```

or using the OS with an equivalent of:

```
echo -n sdhi2_state > /sys/devices/mux.7/state
echo -n vin0_bt656_state > /sys/devices/mux.7/state  (default)
echo -n sdhi0_state > /sys/devices/mux.8/state       (default)
echo -n vin1_bt656_state > /sys/devices/mux.8/state
```

Bit	Bit = 0	Bit = 1
11	sdhi0_state*	vin1_bt656_state
12	vin0_bt656_state*	sdhi2_state

*=default

14. Location of Operating System (booting)

As mentioned in the above chapter, the SD-card interface is not available when using all cameras.

As a result, an operating system, such as Linux, cannot be loaded from an SD-card.

The source of the operating system may be either a USB device, or it can be loaded by Ethernet by a boot-loader such as U-Boot.

Small boot stubs, kernels or proprietary software may be placed in the QSPI flash device on the ADAS Starter Kit, if desired.

15. Assembly of the ADAS Starter Kit

The ADAS Surround View Kit is delivered without the ADAS Starter Kit.

To assemble the two products, please follow this instructions.

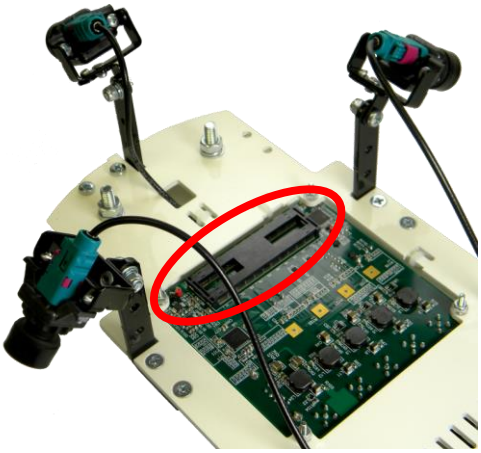
Take your ADAS Starter Kit.

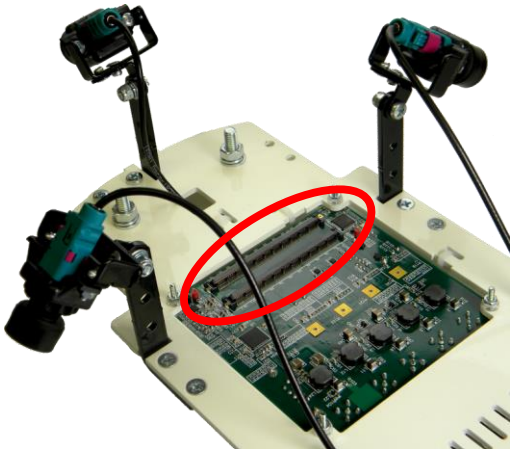
Turn it upside down.

Remove the four plastic bolts from the bottom.

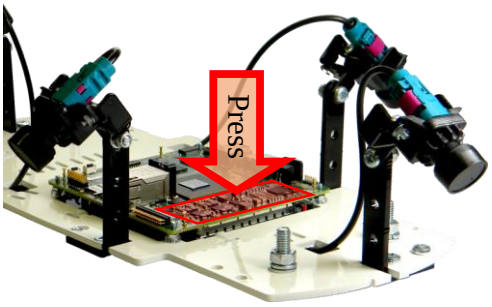
The protective Plexiglas cover will come off.

From the cover, remove the heat sink and the four bolts. These bolts are not needed anymore. (Required tool: Torx T9)

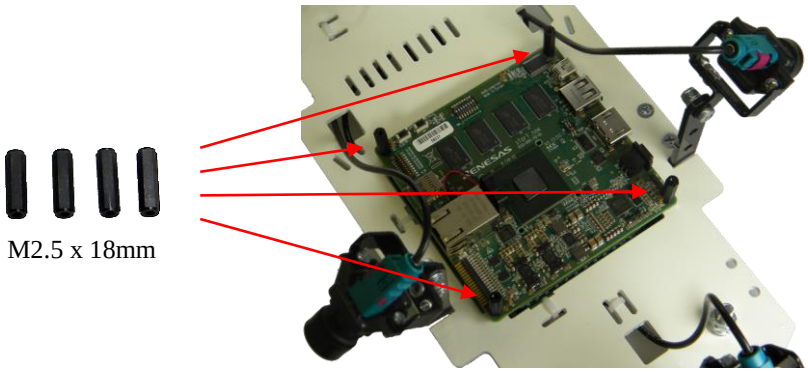




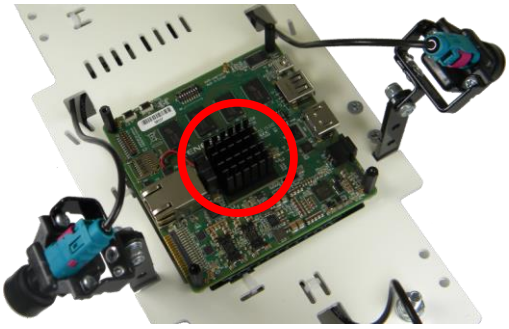
If the CoM Express production cover is still present, remove it.



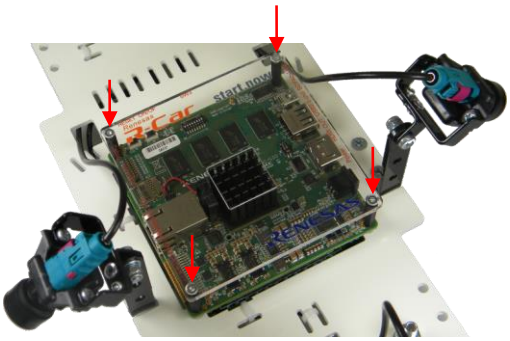
Insert the ADAS Starter Kit board on top of the ADAS Surround View Kit board. Press on the CoM Express connector. When inserting the first time, the CoM Express connector will be very stiff. Please be careful not to damage the products.



Assemble the four bolts supplied with view now to the four screws in the corners of the PCB.



Replace the heatsink on the R-Car H2 device. Be careful not to damage anything with the sharp corners of the heatsink. Note the orientation of the fins. They must be arranged as in the image above, to allow optima air-flow.



Place the Plexiglas cover on top of the heat sink. Be sure to mate the heatsink with the depression in the Plexiglas. Replace the four screws to fasten the Plexiglas cover.

Remove the protective plastic cover from all four cameras.

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		Page	Summary
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