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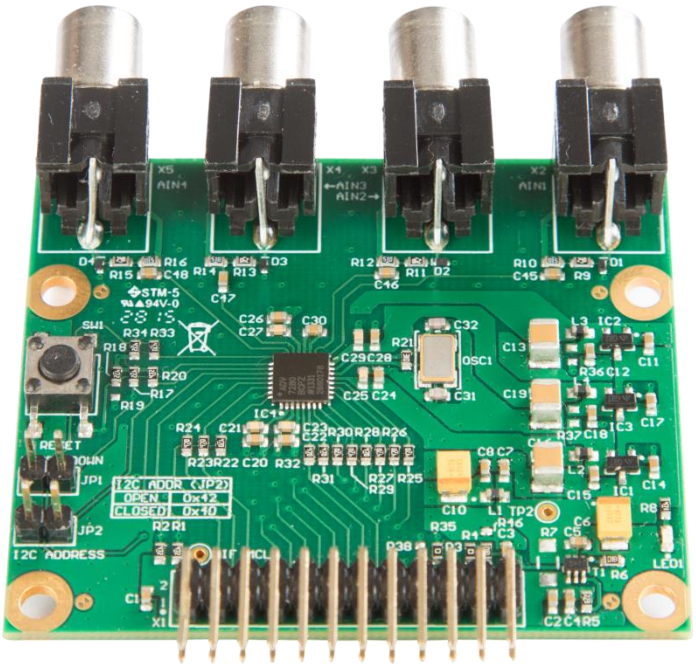
Analogue Camera Adapter

Datasheet



Revision History

Date	Doc. Rev.	ACA Version	Changes
30-Sept-2015	V1.0	V2.0	Initial Release
08-June-2016	V1.1	V2.0	Section 4.0, Pin Mapping: Minor corrections
10-Oct-2016	V1.2	V2.0	Section 4.0, Pin Mapping: Updated

Contents

1. Introduction

Analogue Camera Adapter (ACA) is an interface board designed to easily connect the analogue cameras to the Colibri or Apalis Carrier board using Parallel Camera Interface (CIF). The Analogue Camera Adapter accepts NTSC/PAL/SECAM standard composite video signals and converts the video signals into a YCrCb 4:2:2 video data stream that is compatible with the 8-bit ITU-R BT.656 interface standard with external HSync/VSync signals. Up-to 4 analog cameras can be connected to the ACA V2.0.

The ACA V2.0 uses Analog Devices, ADV7280 multi-format video decoder with deinterlacer solution. ADV7280 supports advanced interlaced-to-progressive (I2P) function allows the ADV7280 to convert an interlaced video input into a progressive video output. This function is performed without the need for external memory.

Parallel Camera Interface (CIF) is a module specific feature and may not be supported by all the computer-on-modules in the Colibri family. For more details, refer to the datasheet of Colibri computer-on-modules.

1.1. Reference Documents

For detailed technical information about suitable computer modules, please refer to the documents listed below.

1.1.1 Colibri Computer Modules

An overview of the Colibri product family:

https://www.toradex.com/computer-on-modules/colibri-arm-family

1.1.2 Apalis Computer Modules

An overview of the Apalis product family:

https://www.toradex.com/computer-on-modules/apalis-arm-family

1.1.3 Colibri Carrier Board

An overview of the Colibri carrier board product family:

https://www.toradex.com/products/carrier-boards/by-colibri-arm-family

1.1.4 Apalis Carrier Board

An overview of the Apalis carrier board product family:

https://www.toradex.com/products/carrier-boards/by-apalis-arm-family

1.1.5 Analog Devices, ADV7280

An overview of the Analog Devices, ADV7280:

http://www.analog.com/en/products/audio-video/video-decoders/adv7280.html

2. Features

2.1. Overview

The Analogue Camera Adapter (ACA) V2.0 provides the following features:

- Uses Analog Devices, ADV7280 video decoder.
- Analogue Input : 4 multiplexed video input channels, supporting NTSC / PAL / SECAM composite video signals.
- Parallel data output format:
  8-Bit Parallel ITU-R BT.656 with external HSync and VSync
- No external power supply required.

2.2. Hardware Architecture Block Diagram

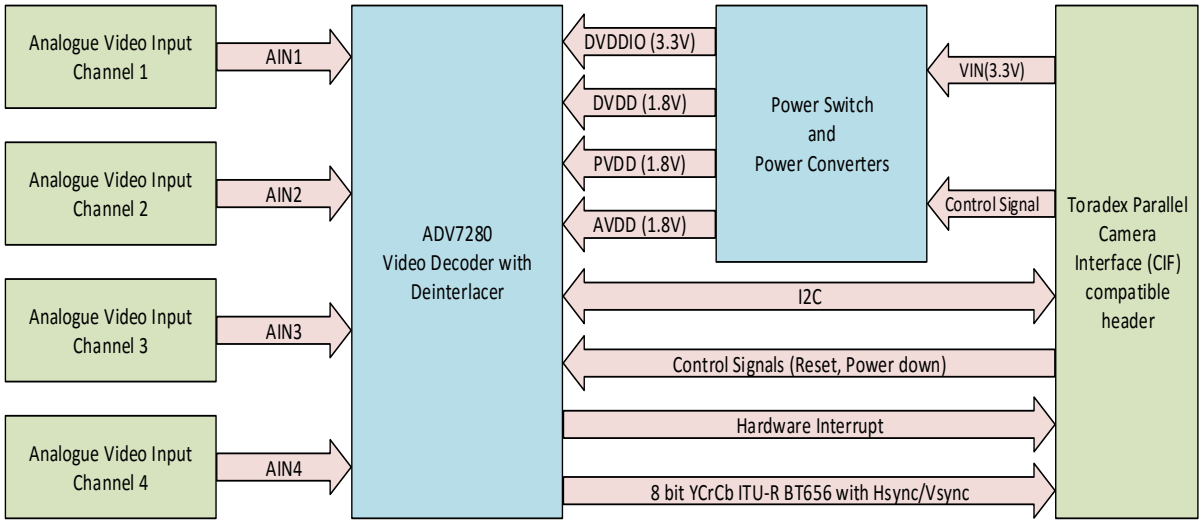


Fig.1 ACA V2.0 Hardware Architecture

2.3. Physical Drawings

2.3.1 Top Side Connectors

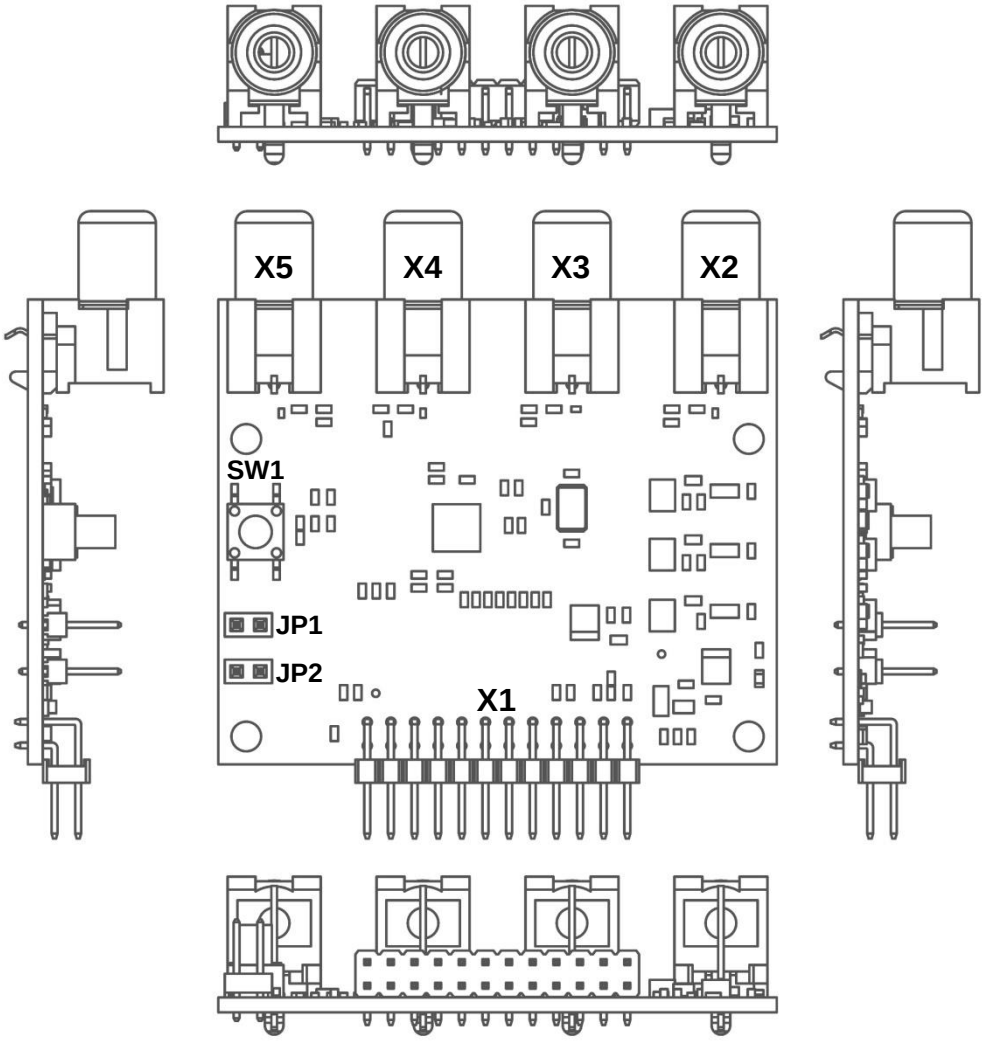


Fig.2 ACA Connectors – Top Side

Ref	Description	Remarks
X1	Parallel Camera Interface Connector	
X2	Camera Input-1 Connector	
X3	Camera Input-2 Connector	
X4	Camera Input-3 Connector	
X5	Camera Input-4 Connector	
JP1	Power Down Jumper	
JP2	I2C Address Select Jumper	
SW1	Reset Switch	

2.4. Assembly Options

This section marks/highlights the components on the Analogue Camera Adapter (ACA) that can be used to configure different features and functional options.

WARNING:

- Changing the PCB assembly voids the product warranty.
- Toradex doesn't take any responsibility for malfunction or damages caused by changing any assembly option.

2.4.1 Assembly Options – Top Side

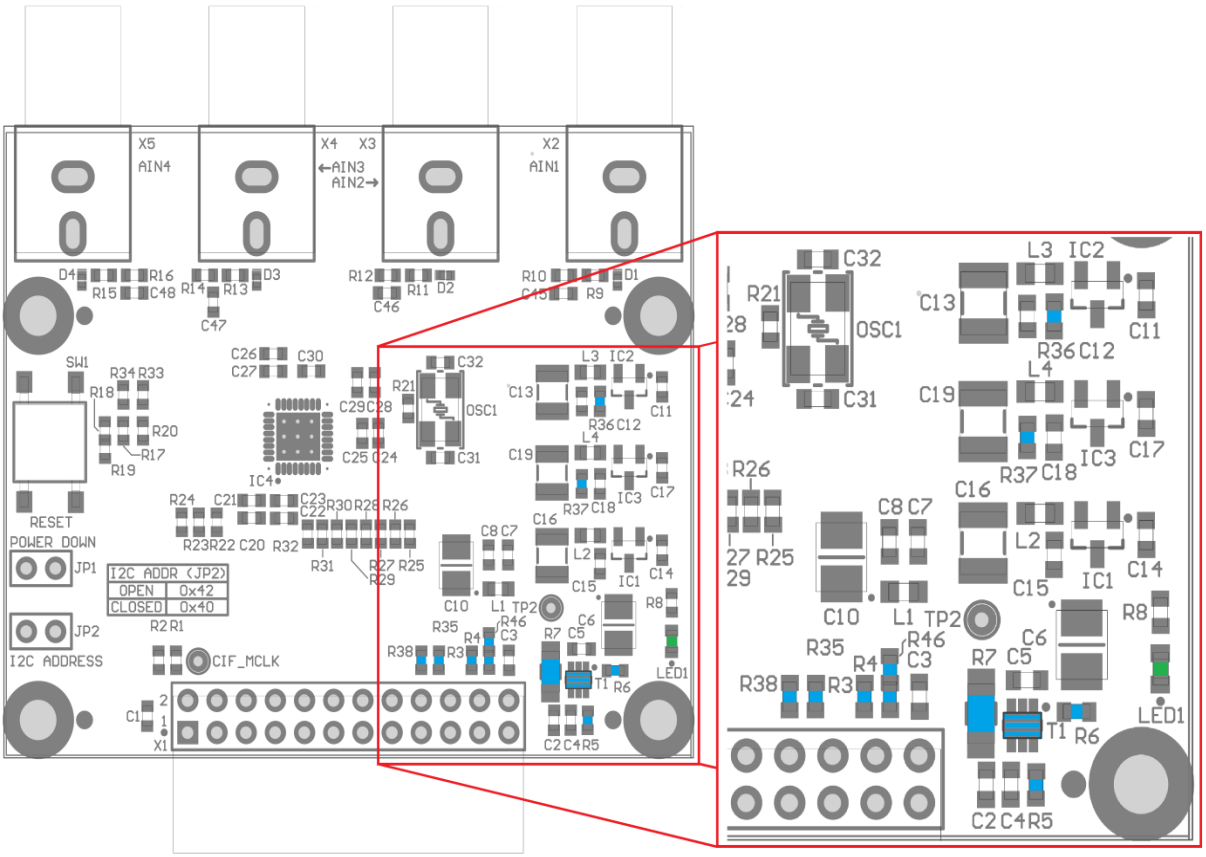


Fig.3 ACA Assembly Options– Top Side

3. Interface Description

3.1. Power Supply

The Analogue Camera Adapter (ACA) is powered using the connector X1. No external power supply is required to power-up the ACA. A load switch (T1) assembled on the ACA is used to control the power rail using PWR_CTRL signal (connector X1, pin 22).

By default, the load switch is kept in ON state; thus powering the ACA circuits. For more details, please refer to the Analogue Camera Adapter (ACA) schematics.

The following table describes the assembly options available on the ACA with respect to the power supply:

Solution Selected	Assembly Options	Assembled Components on ACA V2.0	PCB Side
Load switch (T1) always in ON state	Assemble components R3, R4, R5, R6, T1 Disassemble components R46, R7	R3, R4, R5, R6, T1	Top
Control Load switch (T1) using GPIO (PWR_CTRL signal)	Assemble components R3, R5, R6, R46, T1 Disassemble components R4, R7	R3, R4, R5, R6, T1	Top
Bypass Load switch (T1) to power-up ACA	Assemble components R7 Disassemble components R3, R4, R5, R6, R46, T1	R3, R4, R5, R6, T1	Top

Please refer to figure 3 in *Section 2.4, Assembly Options* for the position of the components.

3.2. Indications

An LED indication is provided on the Analogue Camera Adapter (ACA) to indicate the presence of +3.3V_IN power. Please refer Analogue Camera Adapter (ACA) V2.0 schematic for more details.

Ref.	Description	Remarks
LED1	+3.3V_IN	Please refer to figure 3 in *Section 2.4, Assembly Options* for the position of the LED.

3.3. Parallel Camera Interface

3.3.1 Parallel Camera Interface Connector (X1)

Connector Type: FCI 68021-224HLF, Right angled male header, 2x12 pins, 2.54mm pitch

Pin	Name	Description	I/O Type	Voltage	Pullup/Pulldown
1	+3.3V		PWR		
2	+3.3V		PWR		
3	CIF_MCLK		O	+3.3V	
4	CIF_PCLK	Line-Locked Output Clock	O	+3.3V	
5	CIF_HSYNC	Horizontal Synchronization Output Signal	O	+3.3V	
6	CIF_VSYNC	Vertical Synchronization Output Signal	O	+3.3V	
7	CIF_D0	Video Pixel Output, Bit 0	O	+3.3V	
8	CIF_D1	Video Pixel Output, Bit 1	O	+3.3V	
9	CIF_D2	Video Pixel Output, Bit 2	O	+3.3V	
10	CIF_D3	Video Pixel Output, Bit 3	O	+3.3V	
11	CIF_D4	Video Pixel Output, Bit 4	O	+3.3V	
12	CIF_D5	Video Pixel Output, Bit 5	O	+3.3V	
13	CIF_D6	Video Pixel Output, Bit 6	O	+3.3V	
14	CIF_D7	Video Pixel Output, Bit 7	O	+3.3V	
15	I2C_SCL	I2C Clock	I	+3.3V	4.7K to +3.3V
16	I2C_SDA	I2C Data	I/O	+3.3V	4.7K to +3.3V
17	NRESET	ADV7280 Reset Input Signal Refer to the assembly details.	I	+3.3V	
18	NPWRDWN	ADV7280 Power-down Input Signal Refer to the assembly details.	I	+3.3V	
19	GND		PWR		
20	GND		PWR		
21	CIF_IRQN	ADV7280 Hardware Interrupt Signal	O	+3.3V	4.7K to +3.3V_IN
22	PWR_CTRL	Load Switch Control Signal Refer to the assembly option details in the *Section 3.1, Power Supply*	I	+3.3V	
23	+3.3V		PWR		
24	+5.0V		PWR		

The following table describes the assembly options available on the ACA:

Solution Selected	Assembly Options	Assembled Components on ACA V2.0	PCB Side
Control ADV7280 device reset using GPIO (NRESET signal)	Assemble components R35	R35	Top
Control ADV7280 device power down using GPIO (NPWRDWN signal)	Assemble components R38		Top

Please refer to figure 3 in *Section 2.4, Assembly Options* for the position of the components.

3.4. Analogue Camera Inputs

3.4.1 Camera Input-1 Connector (X2 aka AIN1)

Connector Type: Kycon KLPX-0848A-2-B, RCA Phono Connector, Right angled

Pin	Name	Description	I/O Type	Voltage	Pullup/Pulldown
1	CVSB_IN1	Composite Video Input, Channel 1	I		
2	GND			PWR	

3.4.2 Camera Input-2 Connector (X3 aka AIN2)

Connector Type: Kycon KLPX-0848A-2-B, RCA Phono Connector, Right angled

Pin	Name	Description	I/O Type	Voltage	Pullup/Pulldown
1	CVSB_IN2	Composite Video Input, Channel 2	I		
2	GND			PWR	

3.4.3 Camera Input-3 Connector (X4 aka AIN3)

Connector Type: Kycon KLPX-0848A-2-B, RCA Phono Connector, Right angled

Pin	Name	Description	I/O Type	Voltage	Pullup/Pulldown
1	CVSB_IN3	Composite Video Input, Channel 3	I		
2	GND			PWR	

3.4.4 Camera Input-4 Connector (X5 aka AIN4)

Connector Type: Kycon KLPX-0848A-2-B, RCA Phono Connector, Right angled

Pin	Name	Description	I/O Type	Voltage	Pullup/Pulldown
1	CVSB_IN4	Composite Video Input, Channel 4	I		
2	GND			PWR	

3.5. Control Signals

3.5.1 Power Down Jumper (JP1)

Connector Type: Samtec TSW-101-07-G-D, Male header, 1x2 pins, 2.54mm pitch

Pin	Name	Description	I/O Type	Voltage	Pullup/Pulldown
1	NPWRDWN	ADV7280 Power Down Signal			4.7K to +3.3V_IN
2	GND		PWR		

Jumper JP1, pin 1 is connected to the $\overline{PWRDWN}$ pin (pin 31) of the ADV7280. A logic low on this pin places the ADV7280 in power-down mode.

Jumper (JP1) Status	Remarks
Open circuited	ADV7280 is in power-up mode
Short circuited	ADV7280 is in power-down mode

3.5.2 I2C Address Select Jumper (JP2)

Connector Type: Samtec TSW-101-07-G-D, Male header, 1x2 pins, 2.54mm pitch

Pin	Name	Description	I/O Type	Voltage	Pullup/Pulldown
1	ALSB				4.7K to +3.3V_IN
2	GND		PWR		

Jumper JP2, pin 1 is connected to the ALSB pin (pin 26) of the ADV7280. When ALSB is set to Logic 0, the write address is 0x40; when ALSB is set to Logic 1, the write address is 0x42.

Jumper (JP1) Status	Remarks
Open circuited	ADV7280, I2C write address set to 0x42
Short circuited	ADV7280, I2C write address set to 0x40

3.5.3 Reset Switch (SW1)

Connector Type: Chi Fung TS-06M-CHM-P-T/R, Tactile Switch, SMD

Pin	Name	Description	I/O Type	Voltage	Pullup/Pulldown
1,2	NRESET	ADV7280 Reset Signal (Active Low)			4.7K to +3.3V_IN
3,4	GND		PWR		

4. Pin Mapping

The 24 pins connector (X1) on the Analogue Camera Adapter (ACA) V2.0 is used to connect the ACA with the Toradex Carrier boards. A 24 ways IDC ribbon cable connector or custom cable can be used to connect the ACA with the Toradex Carrier boards.

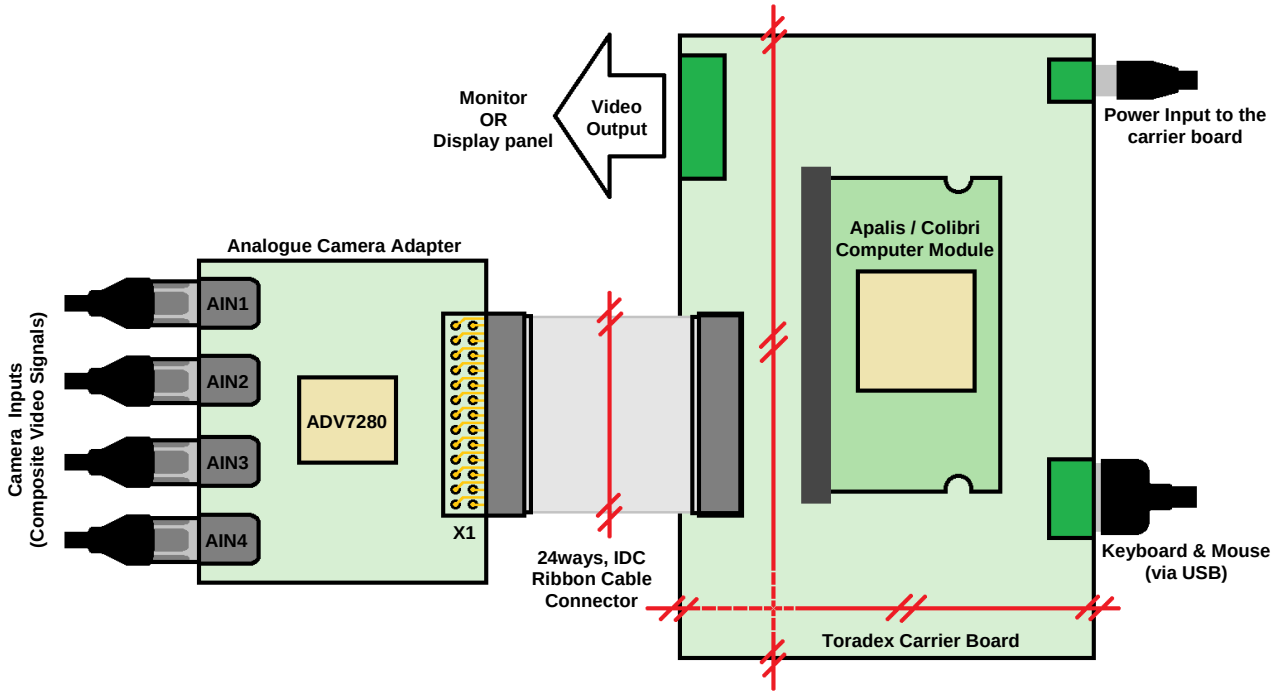


Fig.4 ACA Test Setup - Block Diagram

4.1.1 Interface ACA with Apalis Evaluation Board

The ACA connector (X1) pinout is 1:1 mapped with the Apalis Evaluation Board connector X22. A 24 ways IDC ribbon cable connector (1:1) can be used to connect the ACA with the Apalis Evaluation Board.
Figure 5 (below) represents the jumper settings required on the Apalis Evaluation Board.

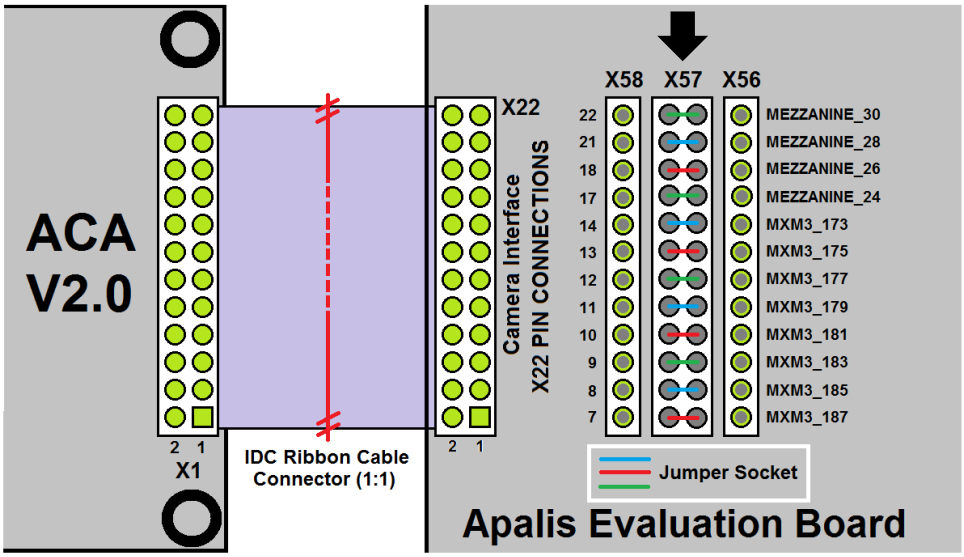


Fig.5 Apalis Evaluation Board Camera Interface Jumper Settings

4.1.2 Interface ACA with Ixora Carrier Board

On the Ixora Carrier Board, Parallel Camera Interface connector (X14) uses a 20 pin header. Following table describes the wiring between the ACA connectors (X1) and the Ixora Carrier Board connector (X14):

ACA Connector (X1)		Ixora Carrier Board Connector (X14)	Remarks
PIN_1 / +3.3V	⟷	PIN_1 / +3.3V	
PIN_2 / +3.3V	⟷	PIN_2 / +3.3V	
PIN_3 / CIF_MCLK	⟷	PIN_3 / CAM1_MCLK	Optional
PIN_4 / CIF_PCLK	⟷	PIN_4 / CAM1_PCLK	
PIN_5 / CIF_HSYNC	⟷	PIN_5 / CAM1_HSYNC	
PIN_6 / CIF_VSYNC	⟷	PIN_6 / CAM1_VSYNC	
PIN_7 / CIF_D0	⟷	PIN_7 / CAM1_D0	
PIN_8 / CIF_D1	⟷	PIN_8 / CAM1_D1	
PIN_9 / CIF_D2	⟷	PIN_9 / CAM1_D2	
PIN_10 / CIF_D3	⟷	PIN_10 / CAM1_D3	
PIN_11 / CIF_D4	⟷	PIN_11 / CAM1_D4	
PIN_12 / CIF_D5	⟷	PIN_12 / CAM1_D5	
PIN_13 / CIF_D6	⟷	PIN_13 / CAM1_D6	
PIN_14 / CIF_D7	⟷	PIN_14 / CAM1_D7	
PIN_15 / I2C_SCL	⟷	PIN_15 / I2C_SCL	
PIN_16 / I2C_SDA	⟷	PIN_16 / I2C_SDA	
PIN_17 / NRESET	⟷	PIN_17 / CAM1_D8	Optional
PIN_18 / NPWRDWN	⟷	PIN_18 / CAM1_D9	Optional
PIN_19 / GND	⟷	PIN_19 / GND	
PIN_20 / GND	⟷	PIN_20 / GND	
PIN_21 / CIF_IRQN	⟷	Not Available	
PIN_22 / PWR_CTRL	⟷	Not Available	
PIN_23 / +3.3V	⟷	Not Available	
PIN_24 / +5V	⟷	Not Available	

Both 20 ways and 24 ways IDC ribbon cable connector (1:1) can be used to connect Ixora carrier board and ACA. If a 24 ways IDC ribbon cable connector is used, the last four pins (pin 21, 22, 23, 24) of the IDC ribbon cable connector remains unconnected on the Ixora Carrier Board connector (X14) side.

4.1.3 Interface ACA with Coibri Evaluation Board V3.2

The ACA connector (X1) pinout is 1:1 mapped with the Colibri Evaluation Board V3.2 connector X22. A 24 ways IDC ribbon cable connector (1:1) can be used to connect the ACA with the Colibri Evaluation Board V3.2.

4.1.4 Interface ACA with Coibri Evaluation Board V3.1

The ACA connector (X1) pinout is not 1:1 mapped Colibri Evaluation Board V3.1 connector X22. A custom cable will be required to connect the ACA to the Colibri Evaluation Board V3.1.

The following table describes the wiring between the ACA connectors (X1) and the Colibri Evaluation Board V3.1 connector (X22):

ACA Connector (X1)		Colibri Evaluation Board V3.1 Connector (X22)	Remarks
PIN_1 / +3.3V	⟷	PIN_1 / +3.3V	
PIN_2 / +3.3V	⟷	PIN_2 / +3.3V	
PIN_3 / CIF_MCLK	⟷	PIN_3 / CIF_MCLK	Optional
PIN_4 / CIF_PCLK	⟷	PIN_4 / CIF_PCLK	
PIN_5 / CIF_HSYNC	⟷	PIN_5 / CIF_HSYNC	
PIN_6 / CIF_VSYNC	⟷	PIN_6 / CIF_VSYNC	
PIN_7 / CIF_D0	⟷	PIN_9 / CIF_D_2	
PIN_8 / CIF_D1	⟷	PIN_10 / CIF_D_3	
PIN_9 / CIF_D2	⟷	PIN_11 / CIF_D_4	
PIN_10 / CIF_D3	⟷	PIN_12 / CIF_D_5	
PIN_11 / CIF_D4	⟷	PIN_13 / CIF_D_6	
PIN_12 / CIF_D5	⟷	PIN_14 / CIF_D_7	
PIN_13 / CIF_D6	⟷	PIN_17 / CIF_D_8	
PIN_14 / CIF_D7	⟷	PIN_18 / CIF_D_9	
PIN_15 / I2C_SCL	⟷	PIN_15 / I2C_SCL	
PIN_16 / I2C_SDA	⟷	PIN_16 / I2C_SDA	
PIN_17 / NRESET	⟷	PIN_7 / CIF_D_0	Optional
PIN_18 / NPWRDWN	⟷	PIN_8 / CIF_D_1	Optional
PIN_19 / GND	⟷	PIN_19 / GND	
PIN_20 / GND	⟷	PIN_20 / GND	
PIN_21 / CIF_IRQN	⟷	PIN_21 / CIF_D_10	Optional
PIN_22 / PWR_CTRL	⟷	PIN_22 / CIF_D_11	Optional
PIN_23 / +3.3V	⟷	PIN_23 / +3.3V	
PIN_24 / +5V	⟷	PIN_24 / +5V	

5. Temperature Range

5.1. Operating Temperature Range

- -10°C to +60°C

6. Mechanical Drawing

6.1. Analogue Camera Adapter Dimensions – Top Side

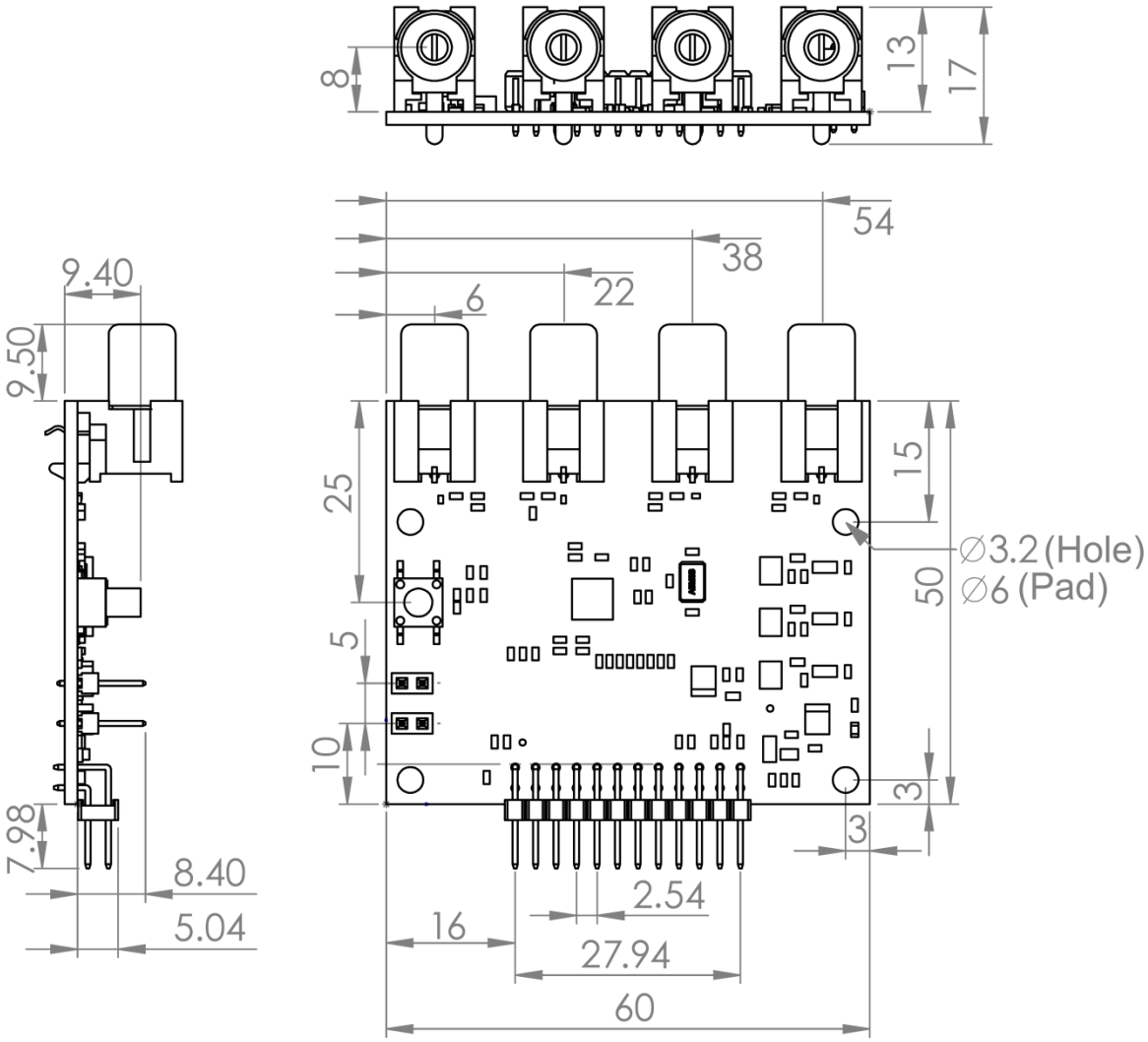


Fig.5 ACA Dimensions – Top Side, all dimensions are in millimetres (mm)

7. Design Data

The design data for Toradex carrier boards are freely available in the Altium Designer format. The design data includes schematics, layout, and component libraries.

To download the carrier board design data, please use the web-link below:
http://developer.toradex.com/hardware-resources/arm-family/carrier-board-design

8. Product Compliance

Up-to-date information about product compliance such as RoHS, CE, UL-94, Conflict Mineral, REACH etc. can be found on our website at: http://www.toradex.com/support/product-compliance

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