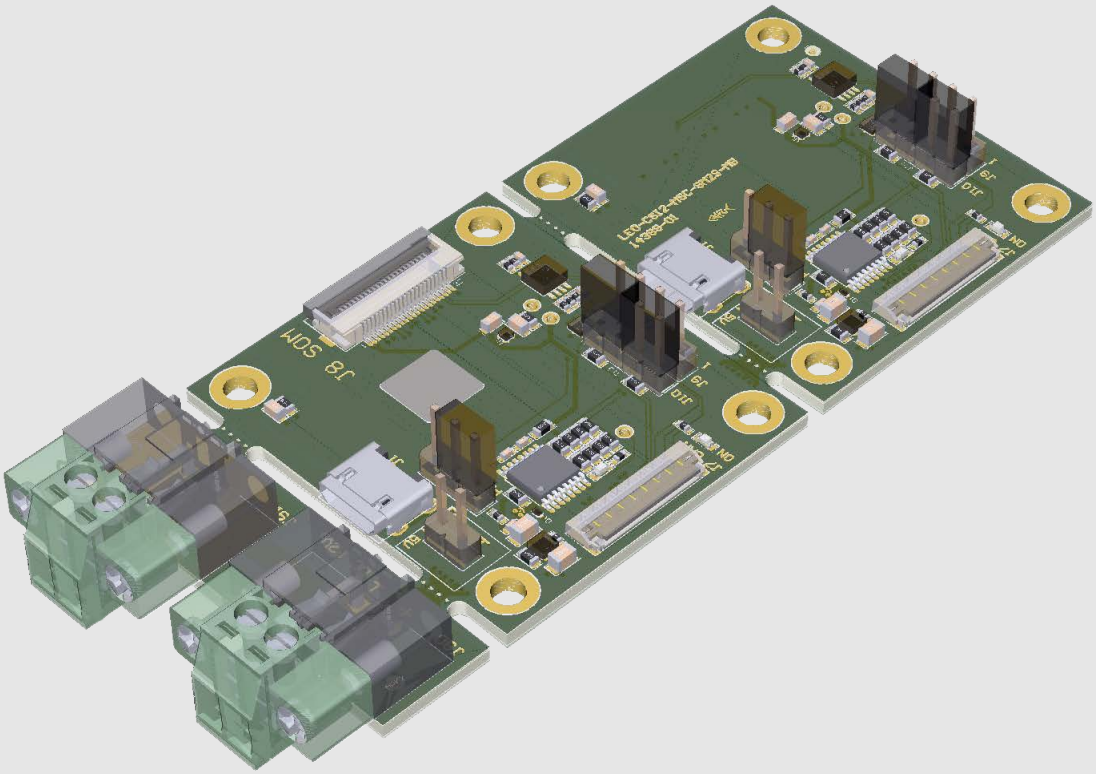
Allied Vision



ALVIUM MIPI CSI-2 CAMERAS

Adapter Board for Avnet MSC SM2S-MB-EP5 User Guide

V1.0.3

Allied Vision Technologies GmbH // Taschenweg 2a, 07646 Stadtroda / Germany

2024-Nov-22

Quick links

- This document at a glance on page 15
- Contact us on page 17
- Contents on page 18

Read before use

EN - English

Safety

Before using the product, read these safety instructions. Observe the warnings at all times. Use the product only as stated in the Intended use on page 24.

CAUTION

Risk of burns

The product in operation can reach temperature levels which could cause burns.

CAUTION

Risk of cuts by sharp edges

The product can have sharp edges.

Intended use

Intended use of Allied Vision product is the integration into vision systems by professionals. All Allied Vision product is sold in a B2B setting.

DA - Dansk

Sikkerhed

Læs sikkerhedsanvisningerne, før produkt bruges. Overhold alle advarsler. Brug kun produkt som anført i Intended use på side 24.

FORSIGTIG

Forbrændingsfare

Når produkt bruges, kan det blive meget varmt og forårsage forbrændinger.

FORSIGTIG

Fare for skarpe kanter

Produktet kan have skarpe kanter.

Tilsigtet brug

Allied Vision produktets tilsigtede brug er en indbygning i et visionssystem, udført af fagfolk. Alle Allied Vision produkter sælges i B2B.

DE - Deutsch

Sicherheit

Bevor Sie das Produkt benutzen, lesen Sie diese Sicherheitshinweise. Beachten Sie diese Hinweise immer. Verwenden Sie das Produkt nur wie beschrieben in Intended use auf Seite 24.

VORSICHT

Gefahr von Verbrennungen

Im Betrieb kann das Produkt Temperaturen erreichen, die zu Verbrennungen führen.

VORSICHT

Schnitte durch scharfe Kanten

Das Produkt kann scharfe Kanten haben.

Bestimmungsgemäßer Gebrauch

Allied Vision Produkte sind bestimmt für die Integration in Bildverarbeitungs-systeme durch Fachpersonal. Alle Allied Vision Produkte werden in einer B2B-Umgebung verkauft.

ES - Español

Seguridad

Antes de utilizar el producto lea estas instrucciones de seguridad. Observe las advertencias en todo momento. Utilice el producto solo tal y como se estipula en el Intended use en la página 24.

ATENCIÓN

Riesgo de quemaduras

El producto en funcionamiento puede alcanzar temperaturas que podrían provocar quemaduras.

ATENCIÓN

Riesgo de cortes por bordes afilados

El producto puede tener bordes afilados.

Uso previsto

El uso previsto del producto Allied Vision es la integración en el sistema de visión por parte de profesionales. Todos los productos Allied Vision se venden dentro de una relación B2B.

FI - Suomi

Turvallisuus

Lue nämä turvallisuusohjeet ennen tuotteen käyttöä. Noudata tuotetta joka hetki. Käytä tuotteen ainoastaan kohdassa Intended use sivulla 24 kuvatulla tavalla.

HUOMIO

Palovammojen vaara

Käytössä olevan tuotteen saavuttamat lämpötilatasot voivat aiheuttaa palovammoja.

HUOMIO

Terävien reunojen aiheuttama viiltovaara

Tuotteessa voi olla teräviä reunoja.

Käyttötarkoitus

Allied Vision-tuotteen käyttötarkoitus on integrointi kuvajärjestelmiin ammattilaisten toimesta. Kaikki Allied Vision-tuotteet myydään B2B-ympäristössä.

FR - Français

Sécurité

Veuillez lire ces consignes de sécurité avant d’utiliser le produit. Respectez continuellement les avertissements. Utilisez le produit uniquement comme indiqué sous Intended use, page 24.

ATTENTION

Risque de brûlures

Le produit en service peut atteindre des niveaux de température susceptibles d’entraîner des brûlures.

ATTENTION

Risque de coupures sur des bords tranchants

Le produit peut présenter des bords tranchants.

Utilisation prévue

L’utilisation prévue du produit Allied Vision est son intégration dans des systèmes de vision par le soin de professionnels. Tout produit Allied Vision est vendu dans un cadre B2B.

HE - עברית

בטיחות

לפני השימוש במוצר, עליך לקרוא את הוראות הביטחון האלו. עליך לממש הוראות ביטחון אלו תמיד.
השימוש במצלמה הוא רק לפי מה שכתוב ב"כוונת השימוש" (Intended use בעמוד 24).

זהירות

סכנת כוויה

בזמן הפעלת המוצר עלולות לעלות טמפרטורות גבוהות, שיכולות לגרום לכוויות.

זהירות

סכנת חתכים על ידי קצוות חדים

למוצר יכולים להיות קצוות חדים.

שימוש מיועד

מוצרי AlliedVision מיועדים לשילוב במערכות ממוחשבת לעיבוד צילומים ע"י אנשי מקצוע.
כל מוצרי AlliedVision נמכרים לשימוש בסביבת B2B.

IT - Italiano

Sicurezza

Leggere queste istruzioni per la sicurezza prima di utilizzare il prodotto. Osservare sempre tutte le avvertenze. Utilizzare il prodotto come descritto alla sezione Intended use a pagina 24.

ATTENZIONE

Pericolo di ustioni

Durante il funzionamento, il prodotto può raggiungere temperature elevate che possono essere causa di ustioni.

ATTENZIONE

Pericolo di tagliarsi sui bordi affilati

I bordi del prodotto lente possono essere affilati.

Uso previsto

Il prodotto Allied Vision è concepito per essere integrato in sistemi di monitoraggio in campo professionale. Tutti i prodotti Allied Vision sono venduti in uno scenario B2B.

JA – 日本語

安全性

本製品を使用する前に、この安全ガイドをお読みください。警告を必ず守ってください。必ず21ページのIntended use 24 ページに従って使用してください。

注意

やけどの危険性

作動中のカメラは、やけどを引き起こす温度まで熱くなる恐れがあります。

注意

な端部で切り傷の危険性

本製品には鋭利な部分がある場合があります。

用途

Allied Vision製品は、専門家が視覚装置に統合することを意図したものです。すべてのAllied Vision製品は、企業間取り引き用に販売されています。

NL - Nederlands

Veiligheid

Lees deze veiligheidsinstructies voordat u het product gebruikt. Neem deze waarschuwingen altijd in acht. Gebruik het product uitsluitend, zoals aangegeven in het Intended use op pagina 24.

VOORZICHTIG

Risico van verbranding

Het gebruikte product, kan temperatuurwaarden bereiken die brandwonden kunnen veroorzaken.

VOORZICHTIG

Risico van snijwonden door scherpe randen

Het product kan scherpe randen hebben.

Beoogd gebruik

Het beoogde gebruik van het Allied Vision-product is de integratie in optische systemen door professionals. Alle Allied Vision-producten worden verkocht in de B2B-markt.

NO - Norsk

Sikkerhet

Les disse sikkerhetsinstruksene før du bruker produkt. Følg advarslene til en hver tid. Bruk kun produkt i samsvar med Intended use på side 24.

FORSIKTIG

Risiko for brannskader

Produktet i bruk kan nå temperaturnivåer som kan forårsake brannskader.

FORSIKTIG

Risiko for kutt fra skarpe kanter

Produktet kan ha skarpe kanter.

Tiltenkt bruk

Den tiltenkte bruken av Allied Vision-produktet er integrering i visjonssystemer av profesjonelle. Alle Allied Vision-produkter selges i en forretning til forretning-situasjon.

SV - Svenska

Säkerhet

Läs igenom säkerhetsinstruktionerna innan du använder produkten. Var hela tiden särskilt uppmärksam på varningarna. Använd enbart produkten på det sätt som anges i Intended use på sida 24.

VARNING

Risk för brännskada

Produkten i drift kan komma upp i temperaturer som kan orsaka brännskador.

VARNING

Risk för skärsår från vassa kanter

Produkten kan ha vassa kanter.

Avsedd användning

Den avsedda användningen av Allied Vision-produkter är integrering i visionssystem av fackmän. Samtliga Allied Vision-produkter säljs i en B2B-miljö.

ZH - 简体中文版

安全需知

在使用产品之前，请阅读这些安全说明。请务必遵守相关警告 和 Intended use 于第 24 页 .

注意事项

烫伤风险

在产品运行过程中，温度可能会上升，导致烧伤的危险。

注意事项

锋利边缘割伤的风险

产品可能有锋利的边缘。

预期用途

Allied Vision 产品的预期用途是由专业人士整合到视觉系统中。所有 Allied Vision 的产品均通过 B2B 渠道销售。

This document at a glance

This chapter includes:

Read this document carefully

Learn to use adapter boards in the most safe and efficient way and avoid damage to your embedded system.

Shipping contents

The delivery consists of:

- Adapter Board CSI-2 MSC SM2S-MB-EP5
- Molex 36 pin FFC (cable), connecting the adapter board to the carrier board (pitch: 0.50 mm, length: 50 mm, Type 1 = contacts on same side, straight)
- Würth Elektronik 22 pin WR-FFC (cable), connecting the adapter board to the SOM (pitch: 0.50 mm, length: 100 mm, Type 1 = contacts on same side, straight)
- 2 × Würth Elektronik WE 691364300002 terminal adapters (for connectors J90 and J91).

FPC cables are not included

Flexible printed circuit (FPC) cables to connect the adapter board to the camera are not included.

What else do you need?

Technical information and ordering of Allied Vision products

- For all information about Alvium CSI-2 cameras and accessories, see www.alliedvision.com/en/support/technical-documentation/alvium-csi-2-documentation.
- Please contact your Allied Vision Sales representative for ordering and for additional information on hardware options for Alvium cameras.

Technical information on Avnet Embedded boards

For information on Avnet Embedded boards, see https://embedded.avnet.com.

Contact us

Website, email

General
www.alliedvision.com/en/contact
info@alliedvision.com

Distribution partners
www.alliedvision.com/en/avt-locations/avt-distributors

Support
www.alliedvision.com/en/support
www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma

Offices

Europe, Middle East, and Africa (Headquarters)
Allied Vision Technologies GmbH
Taschenweg 2a
07646 Stadtroda, Germany
T// +49 36428 677-0 (Reception)
T// +49 36428 677-230 (Sales)
F// +49 36428 677-28

North, Central, and South America, Canada
Allied Vision Technologies Canada Inc.
300 – 4621 Canada Way
Burnaby, BC V5G 4X8, Canada
T// +1 604 875 8855

USA
Allied Vision Technologies, Inc.
102 Pickering Way- Suite 502
Exton, PA 19341, USA
Toll-free// +1-877-USA-1394
T// +1 978 225 2030

Asia-Pacific

China
Allied Vision Technologies Shanghai Co Ltd.
B-510, Venture International Business Park
2679 Hechuan Road
Minhang District, Shanghai 201103
People's Republic of China
T// +86 21 64861133

Japan
Allied Vision Technologies
Yokohama Portside Bldg. 10F
8-1 Sakae-cho, Kanagawa-ku
Yokohama-shi, Kanagawa, 221-0052
T// +81 (0) 45 577 9527

Singapore
Allied Vision Technologies Asia Pte. Ltd
82 Playfair Rd, #07-01 D'Lithium
Singapore 368001
T// +65 6634 9027

Contents

Document history and conventions

This chapter includes:

Document history

Version	Date	Remarks
V1.0.3	2024-Nov-22	Updated temperature values in General specifications on page 30.
V1.0.2	2024-Jul-15	Updated addresses in Contact us on page 17.
V1.0.1	2024-Feb-23	Added UKCA symbol in Compliance notifications on page 24.
V1.0.0	2024-Jan-09	Release version

Table 1: Document history

Conventions used in this user guide

To give this user guide an easily understood layout and to emphasize important information, the following typographical styles and symbols are used:

Typographical styles

Style	Function
Emphasis	Highlighting important things
Web links and references	Links to webpages and internal cross references

Table 2: Typographical styles

Symbols and notes

CAUTION

Risk of burns

Precautions are described

CAUTION

Risk of cuts by sharp edges

Precautions are described.

NOTICE

Material damage

Precautions are described.

Practical tip

Additional information helps to understand or ease handling the camera and components.

Additional information

Web link or reference to an external source with more information is shown.

Component naming

Components described in this user guide are not defined by common standards. Therefore, naming must be accurate to avoid misconceptions. Because naming is lengthy, reading is difficult. Simplified terms are used in this document.

Long version	Short version used in this document
Adapter Board CSI-2 MSC SM2S-MB-EP5	Adapter for MSC SM2S-MB-EP5
MIPI CSI-2[1] adapter board	adapter board
MIPI CSI-2 FPC (flexible printed circuit) cable	FPC cable
MIPI CSI-2 FFC (flat flexible cable)	FFC
SoM	system on module

[1] MIPI CSI-2 Mobile Industry Processor Interface Camera Serial Interface 2

Table 3: MIPI CSI-2 adapter board naming

Compliance, safety, and intended use

This chapter includes:

Compliance notifications

National regulations on disposal must be followed.

Intended use

Allied Vision's objective is the development, design, production, maintenance, servicing and distribution of digital cameras and components for image processing. We are offering standard products as well as customized solutions.

Intended use of Allied Vision product is the integration into Vision systems by professionals. All Allied Vision product is sold in a B2B setting.

Allied Vision isn't a legal manufacturer of medical product. Instead, Allied Vision cameras and accessories may be used as components for medical product after design-in by the medical device manufacturer and based on a quality assurance agreement (QAA) between Allied Vision (supplier) and medical device manufacturer (customer). Allied Vision's duties in that respect are defined by ISO 13485, clause 7.2 (customer-related processes, equivalent to ISO 9001, clause 8.2).

Copyright and trademarks

Your safety

This section informs about issues related to your personal safety. Descriptions explain how to avoid hazards and use adapter boards safely.

Handling hot adapter boards

Electrical components of adapter boards get hot during operation.

Before operation, include adapter boards in housings that disable any contact to hot components.

Sharp edges

The edges of PCBs (printed circuit boards) and the assembled components can be sharp. Be careful these edges do not cut your skin when handling adapter boards.

Product safety

To prevent material damage, read the following to understand risks in using adapter boards.

Embedded systems

Setup and operation of Alvium CSI-2 cameras in embedded systems is different than for cameras in PC-based systems. Components can easily be damaged. If you are unfamiliar with embedded systems, be extremely careful. Follow the instructions in the Alvium CSI-2 Cameras User Guide.

Electrical connections

The MIPI CSI-2 standard does not specify electrical connections as extensively as the USB or GigE standard. Read specifications carefully.

Alvium CSI-2 cameras are not protected against damage caused by reverse polarity.

Electrostatic discharge (ESD)

Electrostatic discharge (ESD) is dangerous for electronic devices, especially when tools or hands get in contact with connectors. We recommend measures to avoid damage by ESD:

- Unpacking: Remove the adapter board from its anti-static packaging only when your body is grounded.
- Workplace: Use a static-safe workplace with static-dissipative mat and air ionization.
- Wrist strap: Wear a static-dissipative wrist strap to ground your body.
- Clothing: Wear ESD-protective clothing. Keep components away from your body and clothing. Even if you are wearing a wrist strap, your body is grounded but your clothes are not.
- Housing: use an ESD protective housing, including the camera, embedded board, adapter board, FFCs, and FPC cables.

Camera power

Operating cameras beyond the specified range damages cameras. Cameras are powered using the FPC connector at a maximum input of 5.5 VDC, using a limited power source (LPS), according to IEC62368-1: 2014 (Second Edition) with minimum 1.5 A per camera. (Depending on the camera model and the intensity of use of the camera by your application, the power consumption may be lower.)

Cameras are not intended to be connected to DC distribution networks.

Flip connectors

FFC and FPC flip connectors enable compact hardware design. The small-sized connectors are sensitive to mechanical stress and are specified for only a few mating and unmating cycles. Especially if you are inexperienced with these connectors, be very cautious. If these connectors are broken, the complete device must be replaced. Follow the instructions in Using the adapter board on page 34 carefully.

- Avoid stress to these connectors.
- Allow only the FFCs and FPC cables to touch conductors.

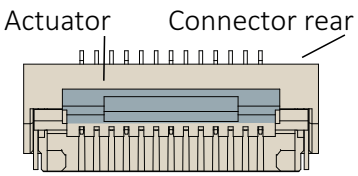


Figure 1: FFC or FPC flip connector, basic structure

22-pin FFC and 36-pin FFC flip connectors

- Move the actuator only between locked and open position.
- Carefully flip the actuator at the middle with your finger nail, see the instructions for connecting 22-pin FFC on adapter boards on page 38 and 36-pin FFC on carrier and adapter boards on page 35.

Additional information on 22-pin and 36-pin FFC flip connectors

For technical data and more instructions, see the manufacturer data sheets:

- 22-pin Würth Elektronik WE 687122149022 FFC ZIF: www.we-online.com
- 36-pin Hirose FH12A-36S-0.5SH flip connectors: www.hirose.com.

22-pin FPC flip connectors

- Move the actuator only between 0° (locked position) to 105° (open position).
- Carefully flip the actuator at the middle with your finger nail, see the instructions for connecting 22-pin FPC on adapter boards and cameras on page 39.

Additional information on Hirose 22-pin FPC flip connectors

For technical data and more instructions on the Hirose FH55-22S-0.5SH connector, see the manufacturer data sheet at www.hirose.com.

22-pin FFC slide connectors

FFC slide connectors are fragile components optimized for one-time plugging. To avoid damage to SoMs:

- Handle FFC connectors only with minimum force.
- Slide the actuator on both ends only.
- Always slide the actuator carefully to open or to close it, parallel to the PCB until you feel a slight resistance.
- Follow the instructions for the corresponding connector type in 22-pin FFC on SoMs on page 37.
- For details on FFC connectors, see the SoM's technical manual.

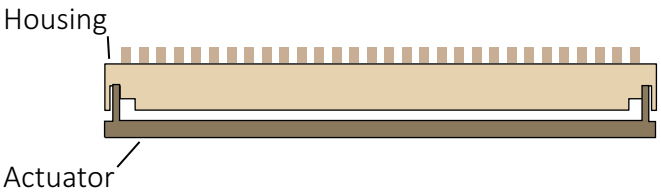


Figure 2: FFC slide connector

FFCs and FPC cables

Avoid mechanical stress

Over-stressed FFCs or FPC cables can damage the camera and connected hardware. When components are twisted against each other or pulled apart from each other with too much force, these cables are over-stressed. Spring contacts of FFC or FPC connectors are worn out, causing short circuits and unreliable electrical connections.

- Allow only slight bending of FFCs or FPC cables (minimum bending radius: 10 mm).
- For strain relief, we recommend you to mount the embedded board, adapter board, and camera to a common base.

Signal quality

Noise and electromagnetic interference can disable camera functions.

- Avoid contact to metal surfaces, causing electromagnetic interference.
- Please use cables recommended by Allied Vision.

MIPI CSI-2 FPC cables

Manufacturing FPC cables or embedded boards

If you want to design your own components to connect Alvium CSI-2 cameras to embedded boards, contact your Allied Vision Sales representative or visit www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma.

FPC cable position

Short circuits of the FPC cable can damage the camera or connected hardware.

- Insert the FPC cable into the connector with cable guiding tabs matching the connector's side guides. See the instructions for connecting 22-pin FPC on adapter boards and cameras on page 39.
- Insert the FPC cables into 22-pin FPC connectors at 12° to the PCB board surface. See the instructions for connecting 22-pin FPC on adapter boards and cameras on page 39.
- Connect the camera and the embedded board (adapter) only as shown by the arrow printed on the FPC cable, see the instructions for connecting 22-pin FPC on adapter boards and cameras on page 39.

No hot-plugging for MIPI CSI-2

Alvium CSI-2 cameras do not support hot-plugging. Hot-plugging can destroy the camera and connected hardware by high inrush current.

Disconnect power supplies before connecting FPC cables.

Specifications

This chapter includes:

General specifications

Feature	Specification
Product code	16422
Product name	Adapter Board CSI-2 MSC SM2S-MB-EP5
PCB number	14389 (see PCB and PCBA number below)
PCBA number	14390 (see PCB and PCBA number below)
Dimensions (Length × width × height [mm])	92.5 × 42.5 × 13.9
Mass (adapter board only)	<30 g
Storage temperature	-20 °C to +85°C (ambient)
Operating temperature	-20 °C to +65 °C (ambient)
Relative humidity	0% to 80% (non-condensing)
Supported carrier board	Avnet MSC SM2S-MB-EP5
Supported SoM (system on module)	Avnet MSC SM2S-i.MX8M Plus
To carrier board: 36-pin FFC flip connector	Hirose FH12A-36S-0.5SH
To SoM: 22-pin FFC flip connector	Würth Elektronik WE 687122149022
To cameras: 22-pin FPC flip connector	Hirose FH55-22S-0.5SH
Supported cameras	Alvium CSI-2 cameras
Supported FPC cables for camera connections	Allied Vision 12316, 12317, 12318, 18947

Table 4: Adapter for MSC SM2S-MB-EP5 specifications

PCB and PCBA number

The PCB number is printed to the topside, the PCBA number is placed anywhere on the circuit board, for example, like this:

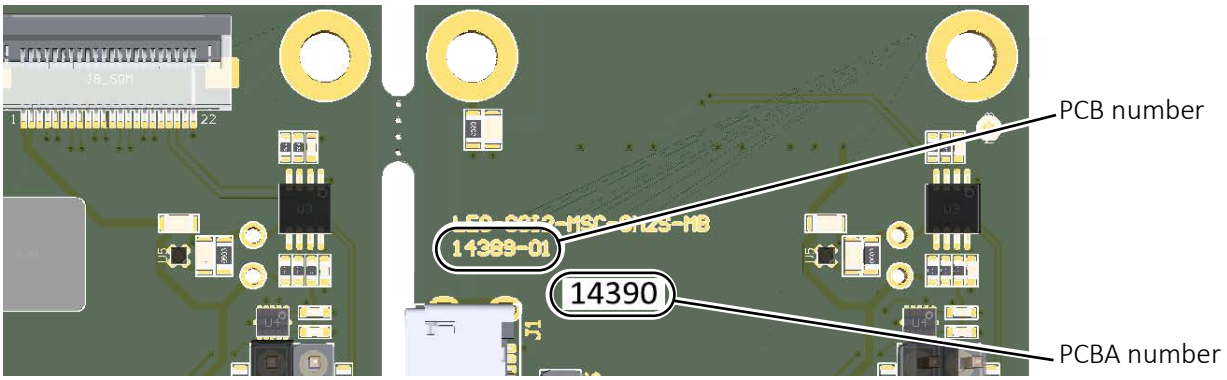


Figure 3: PCB and PCBA number on the adapter board

Dimensions and PCB layout

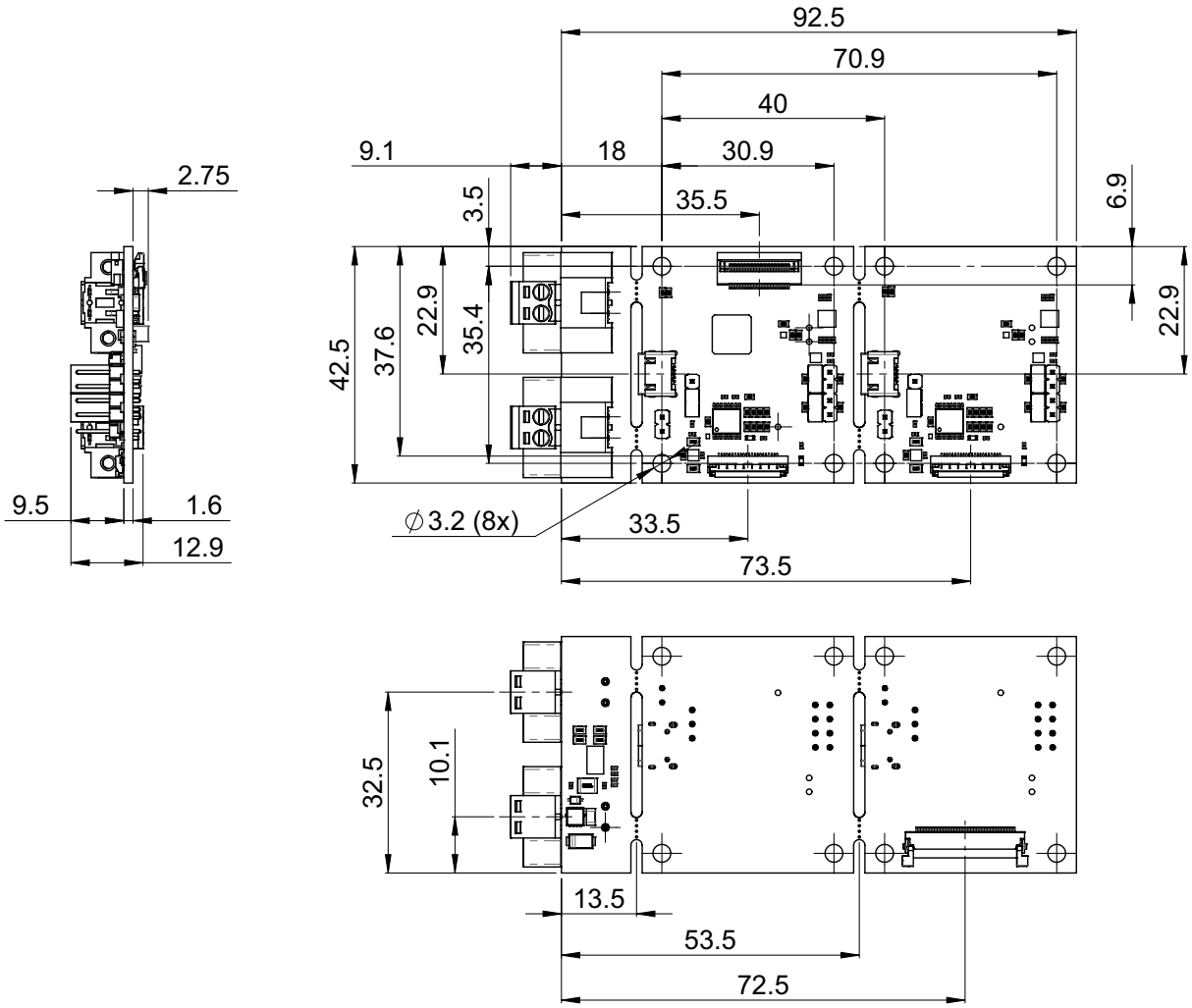


Figure 4: Adapter for MSC SM2S-MB-EP5 dimensions and PCB layout

Electronic schematics

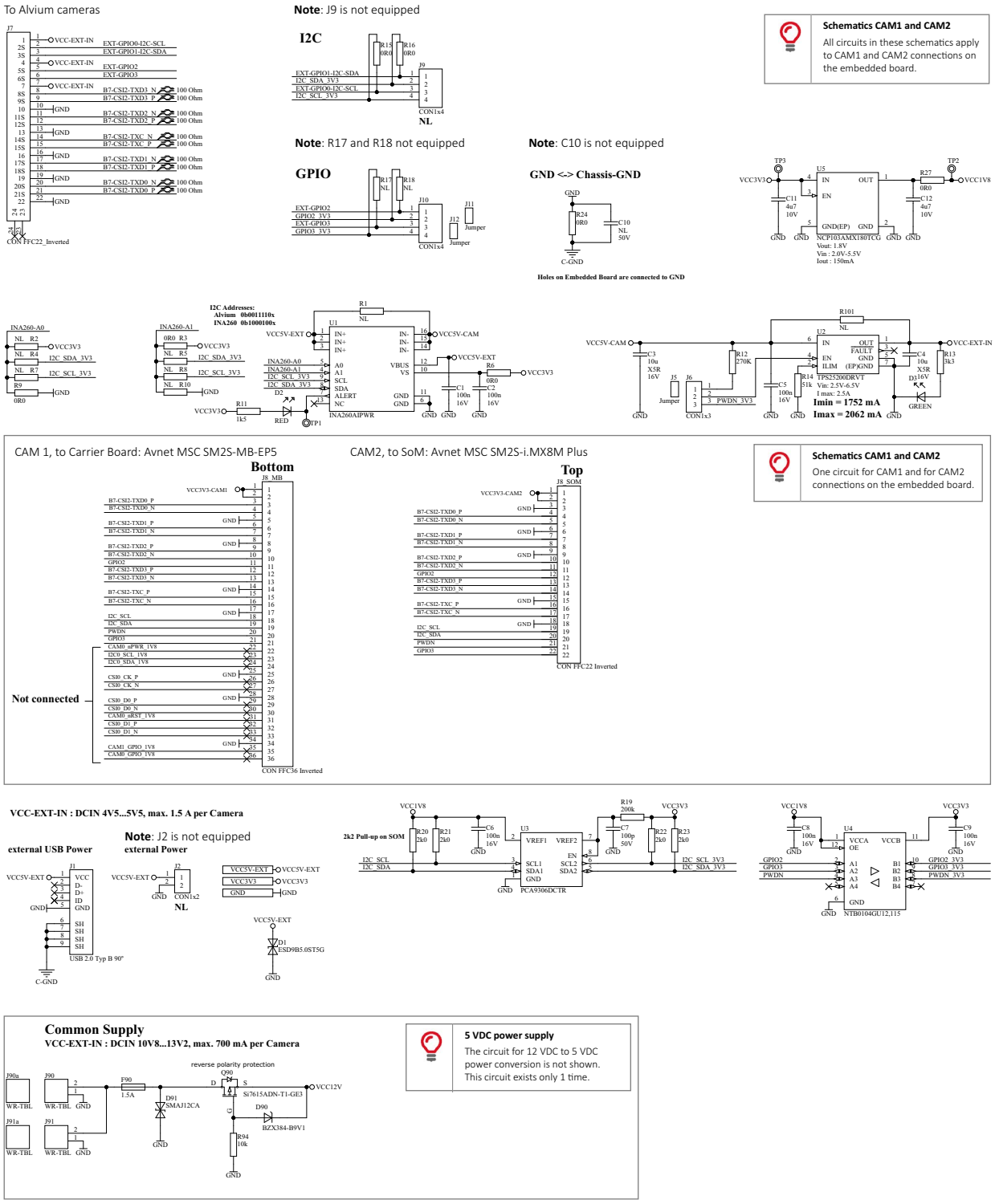


Figure 5: Adapter for MSC SM2S-MB-EP5 electronic schematics

Camera power

NOTICE

Damage to power supplies

If power supplies do not provide sufficient current, they may be damaged.

DC input

Ensure power supplies provide sufficient power according to camera specification.

USB power

Ensure power supplies provide 1.5 A for 1 camera or 3.0 A for 2 cameras. Depending on the camera model and the intensity of use of the camera by your application, the power consumption may be lower.

For USB power, use the USB 2.0 Micro B receptacle J1. See the description in Electronic schematics on page 32 and the instruction in Powering by USB on page 46.

I/O connections

You can use the I/O lines to trigger the camera or to output a signal from the camera to trigger a device, such as a strobe light to control illumination. Camera I/Os can be connected to the embedded board I/Os through the adapter board's pin headers. See Table 5 on page 49 for details.

If you want to reduce signal latencies, such as for triggering the camera by a light barrier, you can connect I/O cables directly to the adapter board. Please see the instructions in Connecting the I/Os on page 47.

Using the adapter board

This chapter includes:

Embedded accessories and Avnet manuals

FPC cables

For more information, see the Alvium Cameras Accessory Guide at www.alliedvision.com/en/support/technical-documentation/alvium-csi-2-documentation.

Designing your own embedded components

If you want to design your own components to connect Alvium CSI-2 cameras to embedded boards, contact your Allied Vision Sales representative or visit www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma.

Avnet Embedded Manuals

For details on the Avnet MSC SM2S-MB-EP5 carrier board and the Avnet MSC SM2S-i.MX8M Plus SoM, including FFC connectors, see the manufacturer's manuals at https://embedded.avnet.com.

Please observe

Proper usage of FFC and FPC connectors is vital for connecting Alvium CSI-2 cameras to embedded boards. Therefore, instructions start with usage of the these connectors. Afterwards, setting up the adapter boards is described.

For technical reasons, the schematic drawings used in these instructions do not fully reflect the actual shape and proportions of cables and connectors. However, they show the position of conductors and how actuators lock cables.

Connecting to FFC and FPC connectors

36-pin FFC on carrier and adapter boards

Figure 6 shows how FFCs connects to 36-pin FFC flip connectors.

Follow the instructions to connect FFCs to 36-pin FFC flip connectors on carrier boards and adapter boards.

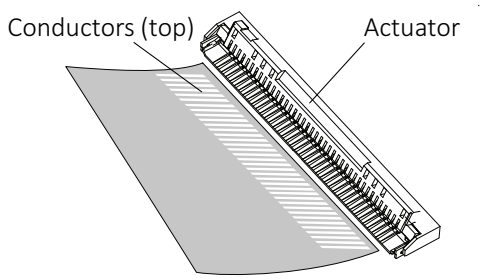


Figure 6: FFC and 36-pin flip connector

1. Opening 36-pin FFC flip connectors on carrier boards and adapter boards:
   With your fingernail*, flip the actuator to open position at 120° to the PCB surface, see Figure 7.

   *Or use a plastic tool, as metal tools can damage the actuator.

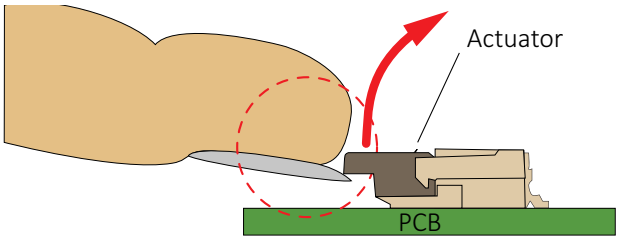


Figure 7: Opening 36-pin FFC flip connectors on adapter boards

2. Take the FFC with conductors pointing upwards and feed it underneath the actuator into the connector at a horizontal angle of 90° to the connector's rear (see Figure 8)...

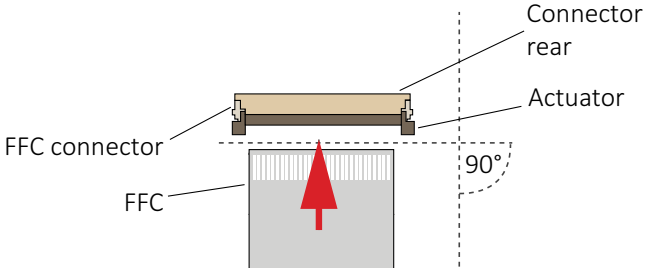


Figure 8: FFC and 36-pin FFC flip connector

3. ...until you feel a slight resistance.

4. Holding the FFC in position, flap down the actuator to closed position (see Figure 9).

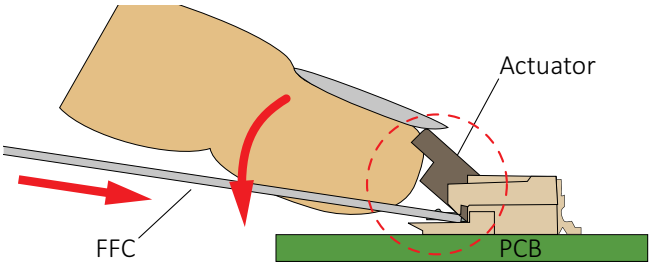


Figure 9: Engaging the FFC in the 36-pin FFC flip connector

22-pin FFC on SoMs

Figure 10 shows how FFCs connects to 22-pin FFC slide connectors.

Follow the instructions to connect FFCs to 22-pin FFC slide connectors on SoMs.

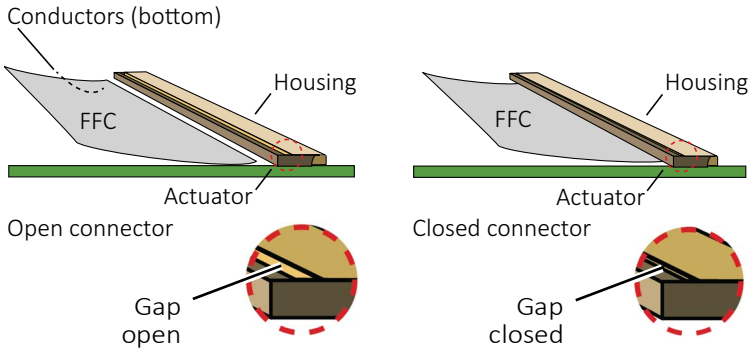


Figure 10: FFC and 22-pin slide connector

NOTICE

Damage to fragile FFC connectors

FFC slide connectors are optimized for one-time plugging.

- Handle FFC slide connectors only with **minimum force**.
- Slide the actuator on **both** ends only.
- Always **slide** the actuator carefully to open or to close it, parallel to the PCB until you feel a **slight** resistance.

1. Opening the 22-pin FFC slide connector:
   On both ends, slide the actuator open with your fingernails* until you feel a **slight resistance**, see Figure 11.

   *Or use a plastic tool, as metal tools can damage the actuator.

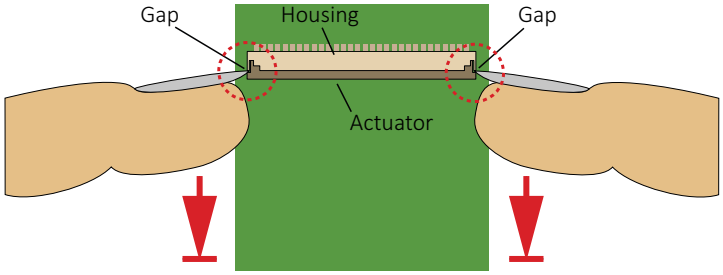


Figure 11: Opening the 22-pin FFC connector on SoMs

2. Take the FFC with conductors facing the PCB and feed it underneath the actuator into the connector at a horizontal angle of 90° to the actuator's front... (see Figure 12)

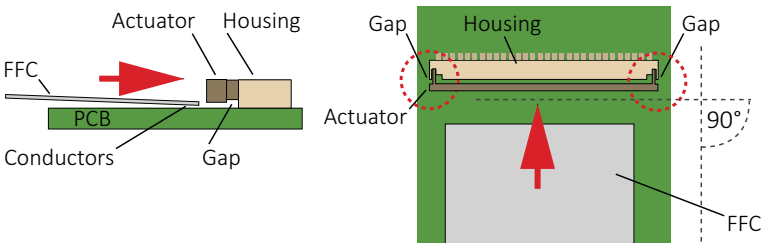


Figure 12: Opening the 22-pin FFC connector on SoMs

3. ...until you feel a slight resistance.
4. Carefully slide the actuator back to closed position (see Figure 13).

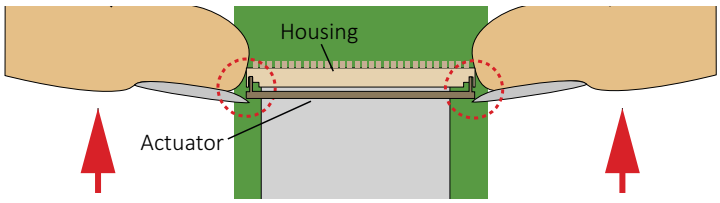


Figure 13: Closing the 22-pin FFC connector on SoMs

22-pin FFC on adapter boards

Figure 14 shows how FFCs connect to 22-pin FFC flip connectors on adapter boards.

Follow the instructions to connect FFCs to 22-pin FFC flip connectors on adapter boards.

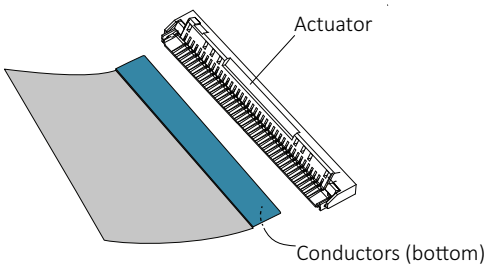


Figure 14: FFC and 22-pin FFC flip connector (open position)

1. Opening 22-pin FFC flip connectors on adapter boards:
   With your fingernail*, flip the actuator to open position at 120° to the PCB surface, see Figure 15.

   *Or use a plastic tool, as metal tools can damage the actuator.

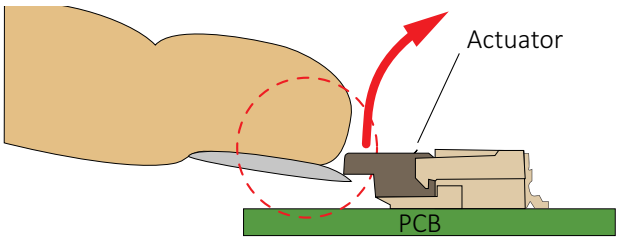


Figure 15: Opening 22-pin FFC flip connectors on adapter boards

2. Take the FFC with conductors facing the PCB and feed it underneath the actuator into the connector at a horizontal angle of 90° to the connector's rear (see Figure 16)...

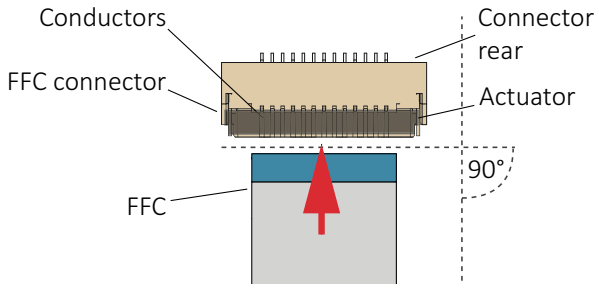


Figure 16: FFC and 22-pin FFC flip connector

3. ...until you feel a slight resistance.

4. Holding the FFC in position, flap down the actuator to closed position (see Figure 17).

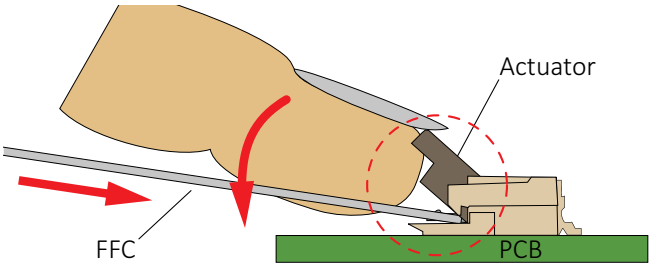


Figure 17: Engaging the FFC in the 22-pin FFC flip connector

22-pin FPC on adapter boards and cameras

Figure 18 shows how FPC cables connect to the 22-pin FPC flip connectors.

Follow the instructions to connect FPC cables to 22-pin FPC flip connectors on adapter boards and cameras.

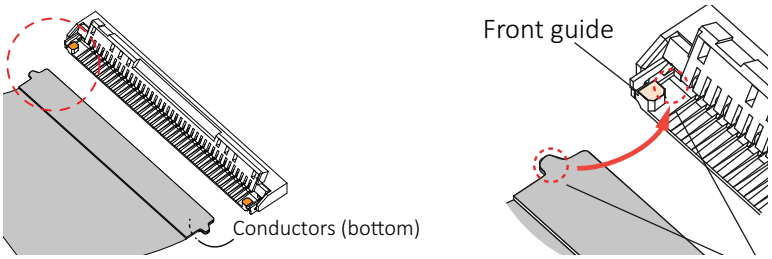


Figure 18: FPC cable and opened 22-pin FPC flip connector

1. Opening 22-pin FPC flip connectors on adapter boards and cameras: With your fingernail*, flip the actuator to open position at 105° to the PCB surface, see Figure 19.

   *Or use a plastic tool, as metal tools can damage the actuator.

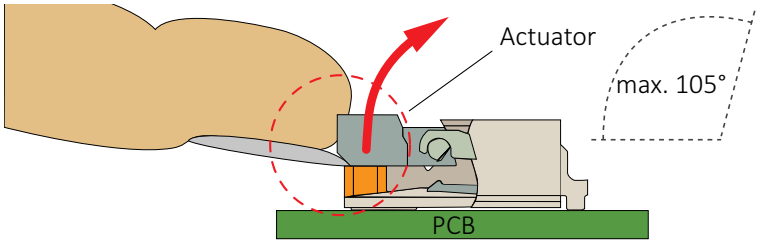


Figure 19: Opening the FPC connector

NOTICE

Damage to the camera by reverse polarity

If Alvium CSI-2 cameras are powered with reverse polarity, camera electronics is damaged.

- Before connecting camera power and I/O power, carefully read the Alvium Cameras User Guide for the FPC connector pin assignment.
- Connect the cable as shown in this section.

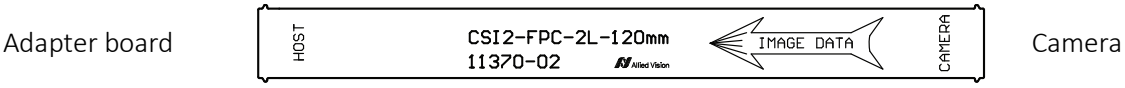


Figure 20: FPC cable image data direction

2. **Ensuring proper cable direction between host and camera**, take the FPC cable with conductors facing the FPC connector conductors (see Figure 21).

3. Take the FPC cable with conductors facing the PCB and feed it into the connector at a horizontal angle of 90° to the connector's rear (see Figure 21) and at a vertical angle of 12° to the PCB (see Figure 22)...

4. ...until cable guiding tabs are caught between connector rear and side guides (see Figure 21). Pull the cable slightly to ensure guiding tabs are properly engaged.

5. Holding the FPC cable in position, flap down the actuator to closed position (see Figure 22).

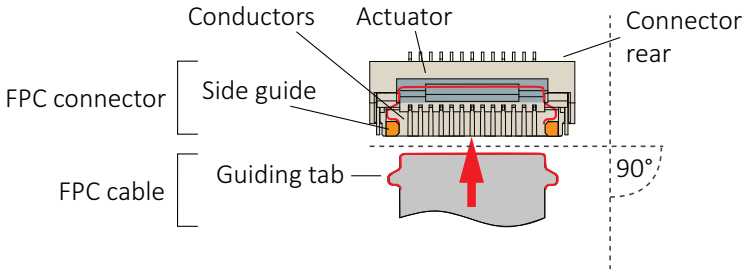


Figure 21: FPC cable and FPC connector

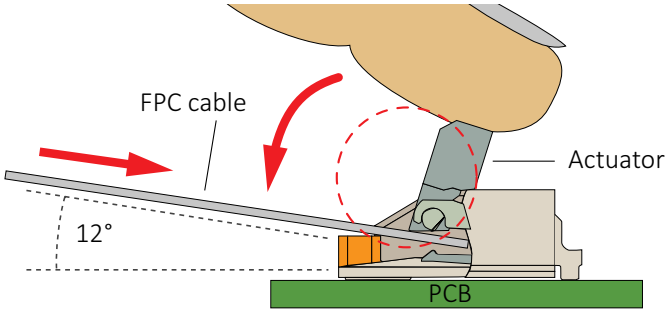


Figure 22: Engaging the FPC cable in the FPC connector

Installing adapter boards

CAUTION

Burns to the skin

Electrical components get hot during operation.

- Before operation, include adapter boards in housings that disable any contact to hot components.

NOTICE

Damage to electronics

- Disconnect all power supplies before installing the adapter board to your embedded board.
- Reconnect power only after installation is complete.
- Mount the embedded board, adapter board, and camera on a common base for strain relief.

NOTICE

Damage to fragile FFC connectors

- Handle FFC connectors only with minimum force.
- Observe that the position of conductors in FFC connectors.
- Follow the instructions in Installing adapter boards on page 41.

Avnet Embedded Manuals

For details on the Avnet MSC SM2S-MB-EP5 carrier board and the Avnet MSC SM2S-i.MX8M Plus SoM, including FFC connectors, see the manufacturer's manuals at https://embedded.avnet.com.

Splitting adapter boards into parts

If you want to connect only one camera, you can split the adapter board in two at the punchings, see the red ovals in Figure 23. In this case, both sections must be connected separately according to the following instructions.

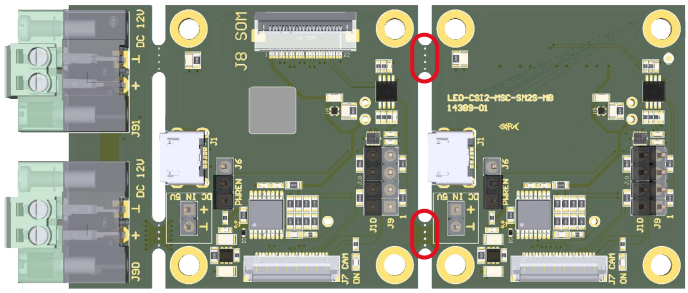


Figure 23: Punchings to split adapter boards into parts

Embedded board connections

If you want to operate only one camera, you may use any of the two available connections between the adapter board and the carrier board or the SoM correspondingly. If you want to operate two cameras, we recommend connecting in the order shown in Figure 24.

These instructions refer to Camera 1 for Connection 1 and to Camera 2 for Connection 2.

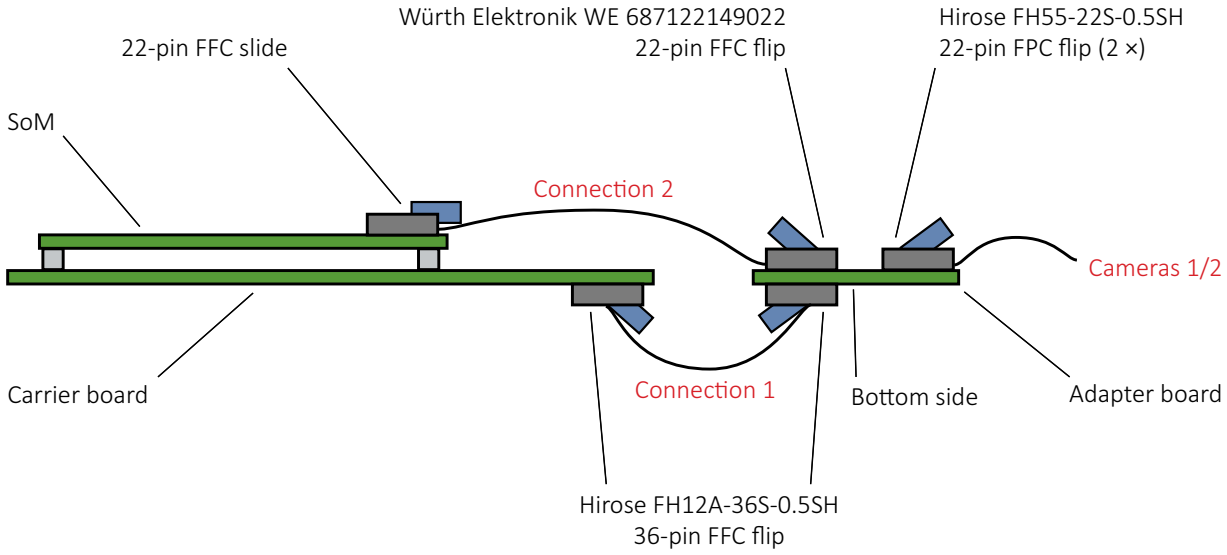


Figure 24: Connections between embedded boards and cameras

Connecting the carrier board

1. With the conductors (b) facing the top of the 36-pin FFC connectors (a),...

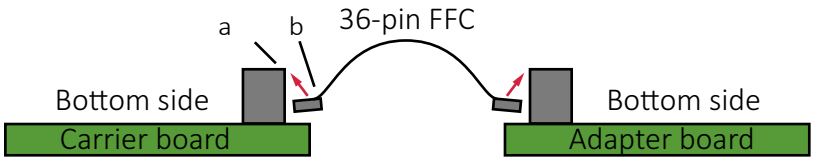


Figure 25: Inserting the FFC between the adapter board and the carrier board

   ...follow the instructions in 36-pin FFC on carrier and adapter boards on page 35 to connect the 36-pin FFC between the

- MIPI-CSI2 Feature Connector on the bottom side of the **carrier board** and the
- J8 MB (c) on the bottom side of the **adapter board**.

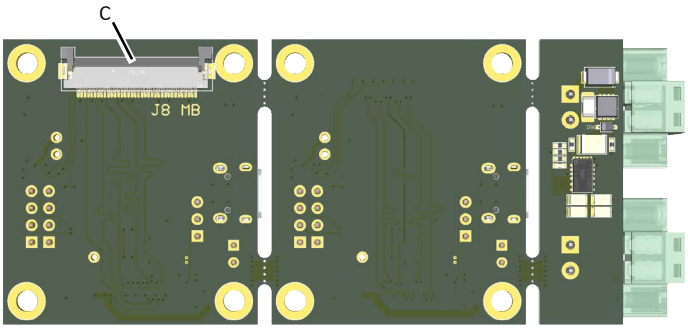


Figure 26: Carrier Board Connector on the bottom side of the adapter board

The carrier board is connected to the adapter board to operate Camera 1.

2. To connect a second camera, continue with Connecting the SoM on page 44.

   Or continue directly with Connecting cameras on page 44.

Connecting the SoM

1. With the conductors (e) facing the PCBs (d),...

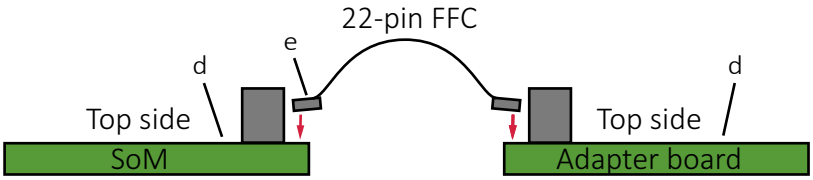


Figure 27: Inserting the FFC between the adapter board and the SoM

...connect the 22-pin FFC between the

- MIPI-CSI2 Feature Connector on the top side of the **SoM** (see 22-pin FFC on SoMs on page 37) and the
- J8 SoM connector (f) on the top side of the **adapter board** (see 22-pin FFC on adapter boards on page 38).

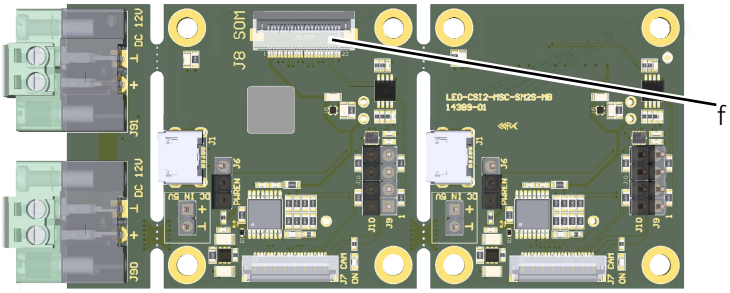


Figure 28: SoM Connector on the top side of the adapter board

The SoM is connected to the adapter board to operate Camera 2.

Connecting cameras

1. Following the instructions in 22-pin FPC on adapter boards and cameras on page 39, connect the FPC cable to the FPC connector (h) for Camera 1 and to the FPC connector (g) for Camera 2.
2. Connect the other ends of the FPC cables to the cameras.

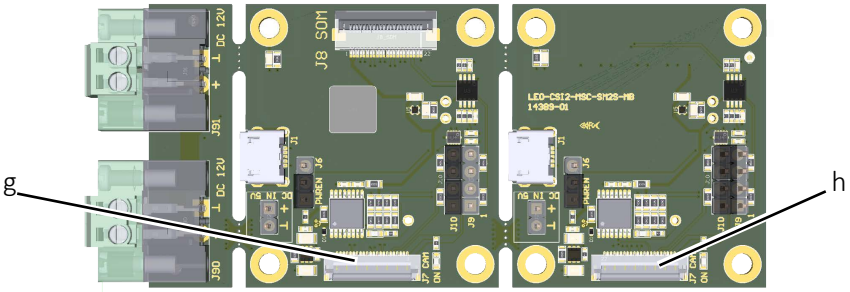


Figure 29: Camera Connectors on the top side of the adapter board

3. Your Alvium CSI-2 cameras are connected to the embedded board.
4. Continue with Connecting power on page 45.

Connecting power

Powering by terminal adapters

NOTICE

Damage to power supplies

If power supplies do not provide sufficient current, they may be damaged.

Ensure power supplies provide sufficient power according to camera specification.

You can power the embedded board and the cameras, using the terminal adapters. Figure 30 shows two different variants:

- **Gray:** Common power for the embedded board and cameras
- **Green:** Separate power for the embedded board and cameras.

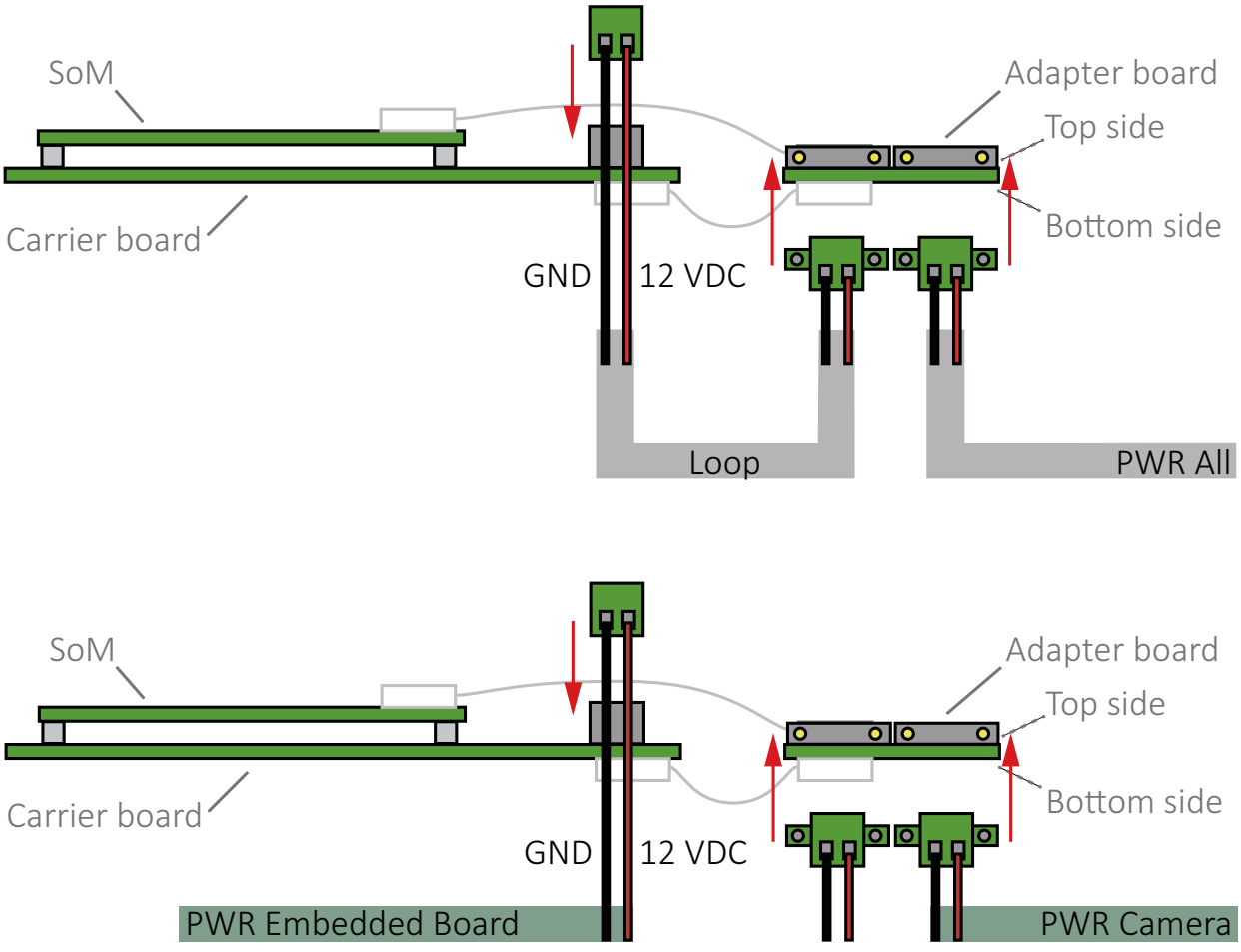


Figure 30: DC power connections

Powering by USB

NOTICE

Damage to power supplies

If power supplies do not provide sufficient current, they may be damaged.

Ensure USB power supplies provide 1.5 A for one camera and 3.0 A for two cameras. Depending on the camera model and the intensity of use of the camera by your application, the power consumption may be lower.

1. Split the adapter board at the punchings (i) to remove the power terminal electronics from the adapter board.

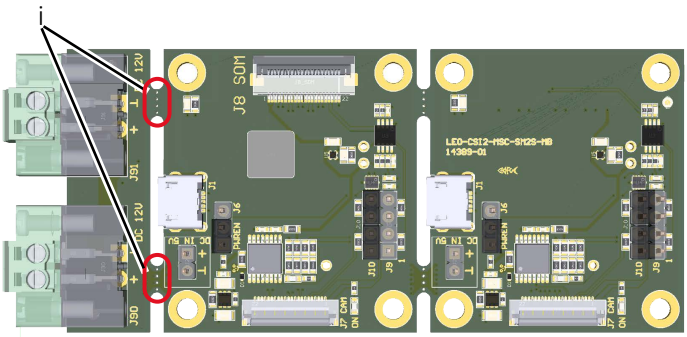


Figure 31: Punchings to remove the power terminal electronics

2. Ensure the USB power supply is disconnected from the mains power.
3. Connect the power supply's output connector to the USB 2.0 Micro B receptacle (k).

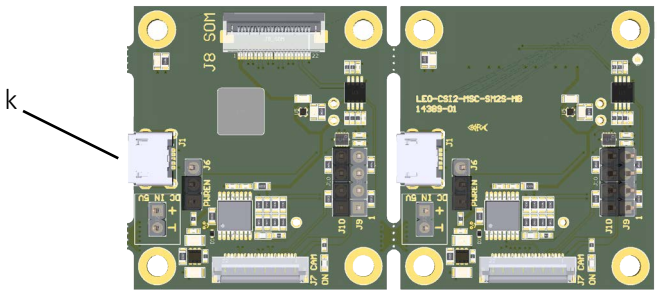


Figure 32: USB power connector

4. Connect the power supply to the mains power.
5. Power and boot the embedded board.

Your Alvium CSI-2 cameras can be operated via the embedded board.

6. Continue with Connecting the I/Os on page 47.

Connecting the I/Os

If you want to use the I/O lines of the **adapter board**, see the following instruction. This way, you reduce signal latencies, such as for triggering the camera by a light barrier.

About this instruction

This is a best-practice solution. Please visit www.alliedvision.com/en/about-us/contact-us/technical-support-repair-/-rma if you have any questions.

1. **Default**: On the pin header of connector J6, set the jumper to **position m** for camera ON when the system is powered. The adapter board is shipped with this jumper position.
   Alternatively, you can set the jumper to **position l**, if you want the embedded board to control camera power by the GPIO, see Electronic schematics on page 32.
2. On the pin header of connector J10 (n), use the I/O pins defined in I/O signal levels and description on page 49.

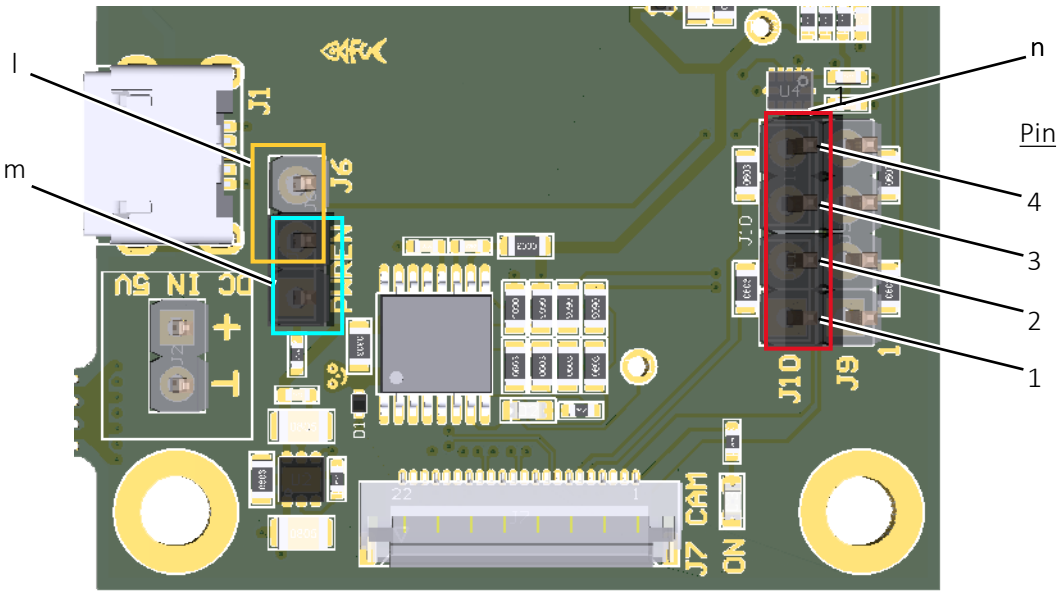


Figure 33: I/O connectors and jumper positions for power control modes

3. Continue with Connecting ground on page 48.

Connecting ground

Connect GND to pin 2 (o) of connector J4.

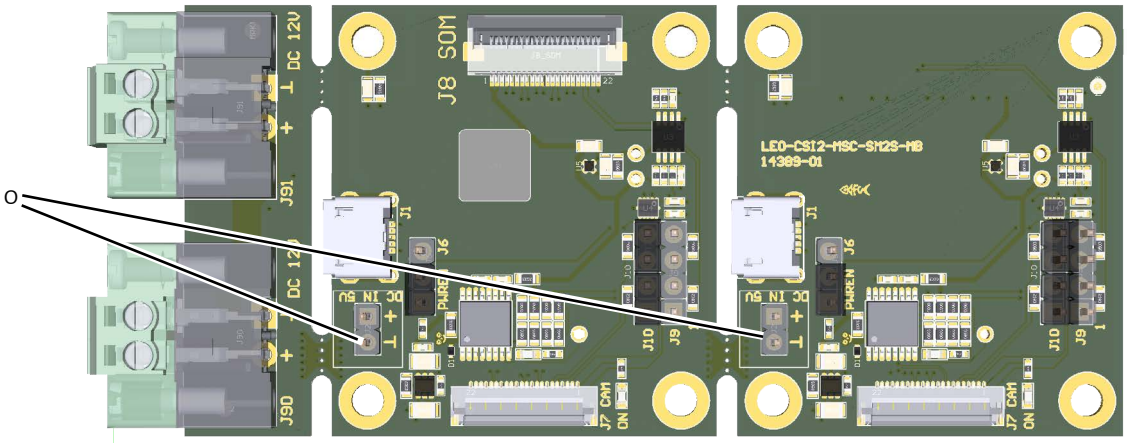


Figure 34: Ground connectors

Your embedded vision system is prepared for operation.

I/O signal levels and description

Table 5 displays the signals for the GPIOs on connector J10, for GND on connectors J2, for VCC12V on connectors J90/J91, for VCC-EXT-IN on the USB connector J1.

Connector	Pin	Signal	< - >	Level	Description
J10	1	EXT-GPIO2	IN/OUT	U_{in} (low) = -0.3 to 0.8 VDC U_{in} (high) = 2.0 to 5.5 VDC U_{out} (low) = 0 to 0.4 VDC U_{out} (high) = 2.4 to 3.3 VDC at max. 12 mA	GPIO Internal pull-up resistor: 33 kΩ to 63 kΩ
J10	2	GPIO2_3V3	IN/OUT	U_{in} (low)[1] = 0 to 1.2 VDC U_{in} (high)[1] = 2.2 to 5.5 VDC U_{out} (low) = 0 to 0.4 VDC U_{out} (high)[1] = 2.9 to 3.3 VDC at max. 50 mA	GPIO Keep external pull-up or pull-down resistor above 50 kΩ
J10	3	EXT-GPIO3	See EXT-GPIO2		
J10	4	GPIO3_3V3	See GPIO2_3V3		
J2	1	VCC-EXT-IN	PWR IN	4.5 to 5.5 VDC	Power supply
J2	2	GND	PWR	0 VDC	Power supply ground
J1	1	VCC-EXT-IN	PWR IN	4.5 to 5.5 VDC	USB power supply
J1	5	GND	PWR	0 VDC	USB power supply ground
J90/J91	1	GND	PWR	0 VDC	Power supply ground
J90/J91	2	VCC12V	PWR IN	10.8 to 13.2 VDC	Power supply

[1]Depends on the 3.3 VDC output voltage of the embedded board

Table 5: I/O connections from the adapter board to the camera