# AGX ORIN MIPI CSI-2 Bridge Board

P/No: FC-AGX-LHMM



## Compatible Cameras:

- LVDS Cameras
  - Sony • Tamron • KT&C • Videology • Wonwoo • Skoopia
- HDMI Cameras
  - Sony HDMI Block Cameras
- 22-pin MIPI CSI-2 Cameras (AstrOptix Orin Super Carrier, Jetson Orin Nano Super Dev Kit and Raspberry Pi 5 pinout Compatible)

## Supported Host Platforms:

- NVIDIA Jetson AGX Orin Developer Kit

## KEY FEATURES

- **Multi-Interface Camera Integration:** Integrates LVDS–MIPI CSI-2, HDMI–MIPI-CSI-2, 2-channel native MIPI CSI-2 interfaces on a single board, fully utilizing all four 4-lane MIPI CSI-2 interfaces on the NVIDIA Jetson AGX Orin.
- **LVDS Camera Interface**
  1. Converts LVDS camera video output to 4-lane MIPI CSI-2
  2. Independent Camera power switch and I²C-to-UART bridge (3.3V CMOS) for VISCA control, with provision for external on board UART connector for camera control
- **HDMI Camera Interface**
  1. Converts HDMI camera video output to 4-lane MIPI CSI-2
  2. Independent Camera power switch and I²C-to-UART bridge (3.3V CMOS) for VISCA control, with provision for external onboard UART connector for camera control
- **Two Native MIPI CSI-2 Interface**
  1. Two Native 22-pin, 4-lane MIPI CSI-2 pass-through connector for direct sensor integration
- **Electrical & Protection**
  1. Wide-range 12–24V DC input
  2. Reverse-voltage and transient-voltage protection
  3. Power-status LEDs
- **Mechanical & Environmental**
  1. Compact 84.87 × 61.95 mm form factor
  2. Board weight: 33.4g
  3. Operating temperature: –20°C to +85°C
- **RoHS compliant.**

## APPLICATIONS

- AI Edge Computing and Multi-Sensor Vision Analytics
- UAV / ISR Multi-Camera Payloads
- Robotics and Autonomous Platforms
- Industrial & Machine Vision Systems
- Defense Surveillance and Reconnaissance Systems
- Medical & Diagnostic Imaging Instruments
- Security and Perimeter Surveillance Cameras
- Research, Development & Rapid Prototyping
- Security and Surveillance Cameras
- Broadcast and Multimedia Streaming

## PRODUCT DESCRIPTION

A single-board camera integration platform built for the NVIDIA Jetson AGX Orin, engineered to bring every major camera interface — LVDS, HDMI and two native MIPI CSI-2 — onto one design, making full use of all four 4-lane MIPI CSI-2 interfaces the AGX Orin has to offer.

At its core, the board bridges LVDS and HDMI camera video output into 4-lane MIPI CSI-2, giving system integrators a direct path to connect industry-standard block cameras without custom bridging hardware of their own. Both interfaces share a dedicated I²C-to-UART bridge (3.3V CMOS) for VISCA control, with an onboard connect available for external camera control when needed. Rounding out the interface set, a two native 22-pin, 4-lane MIPI CSI-2 pass-through connector supports direct integration of MIPI sensors, for applications that don't need format conversion at all.

Built for demanding environments, the board runs on a wide-range 12–24V DC input, with reverse-voltage and transient-voltage protection guarding against field power faults, and power-status LEDs for at-a-glance diagnostics. Its compact 84.87 mm × 61.95 mm footprint and 33.4g weight suit space-constrained embedded enclosures, while a –20°C to +85°C operating range and RoHS compliance support deployment across industrial, defense, and outdoor vision systems.

Ideal for: multi-sensor embedded vision systems, UAV and defense payloads, and industrial camera integration projects requiring flexible support for LVDS, HDMI and two native MIPI camera sources on a single Jetson AGX Orin platform.

## Technical specifications

| PARAMETER | DETAILS |
|---|---|
| **Input Voltage** | 12–24 V DC regulated, wide-input (Molex Micro Lock Plus 2-pin connector) |
| **Camera Interface** | 4 independent ports: LVDS–MIPI CSI-2 (30-pin KEL, LVDS Single mode), HDMI–MIPI CSI-2 (30-pin KEL, HDMI), 2 X Native MIPI CSI-2 (22-pin FPC) |
| **MIPI CSI-2 Output** | AGX Orin camera expansion connector compatible — 120-pin Samtec QTH-060 series, 4 X 4 lane MIPI CSI-2 |
| **I²C Architecture** | 3 independent I²C MUX ICs, each dedicated to a camera port group: TCA9546 for LVDS camera + control and MIPI_CAM0, TCA9543 for HDMI camera + control, another TCA9543 for MIPI_CAM1 |
| **Supported Video Format** | Up to 4K 60fps (camera dependent) |
| **Camera Control** | VISCA over UART (3.3 V CMOS) bridged to I²C (host) for LVDS/HDMI ports |
| **Indicators** | Power LED (Green) |
| **Board Dimensions (L × W)** | 84.87 × 61.95 mm |
| **Weight** | 33.4 g |
| **Operating Temperature** | −20 °C to +85 °C |
| **Compliance** | MIPI CSI-2 Specification, RoHS |
| **Recommended Supply** | 12 V / 3 A regulated (wide-input 12–24 V tolerant) |

## Camera Interface Specification

### PORT 1 — LVDS-MIPI CSI-2 BRIDGE

| PARAMETER | DETAILS |
|---|---|
| Validated Cameras | Sony FCB-EV9520L / FCB-EV9500L, Tamron MP3010M-EV, KT&C ATC-HZ5540T-LP, Videology 24Z2.1W-10XLVDS-462 |
| Camera Interface | 30-pin KEL, LVDS (Single mode) micro-coaxial interface |
| Supported Video Format | Up to Full HD 1080p 60 fps (camera dependent) |
| Camera Control | VISCA over UART (3.3 V CMOS) bridged to I²C (host) via I²C multiplexer |

### PORT 2 — HDMI-MIPI CSI-2 BRIDGE

| PARAMETER | DETAILS |
|---|---|
| Validated Cameras | Sony FCB-ER9500 / FCB-ER8530 / FCB-EW9500H |
| Camera Interface | 30-pin KEL, HDMI micro- coaxial interface |
| Supported Video Format | Up to 4K 60 fps (camera dependent) |
| Camera Control | VISCA over UART (3.3 V CMOS) bridged to I²C (host) via I²C multiplexer |

### PORT 3 — Native MIPI CONNECTOR - 0

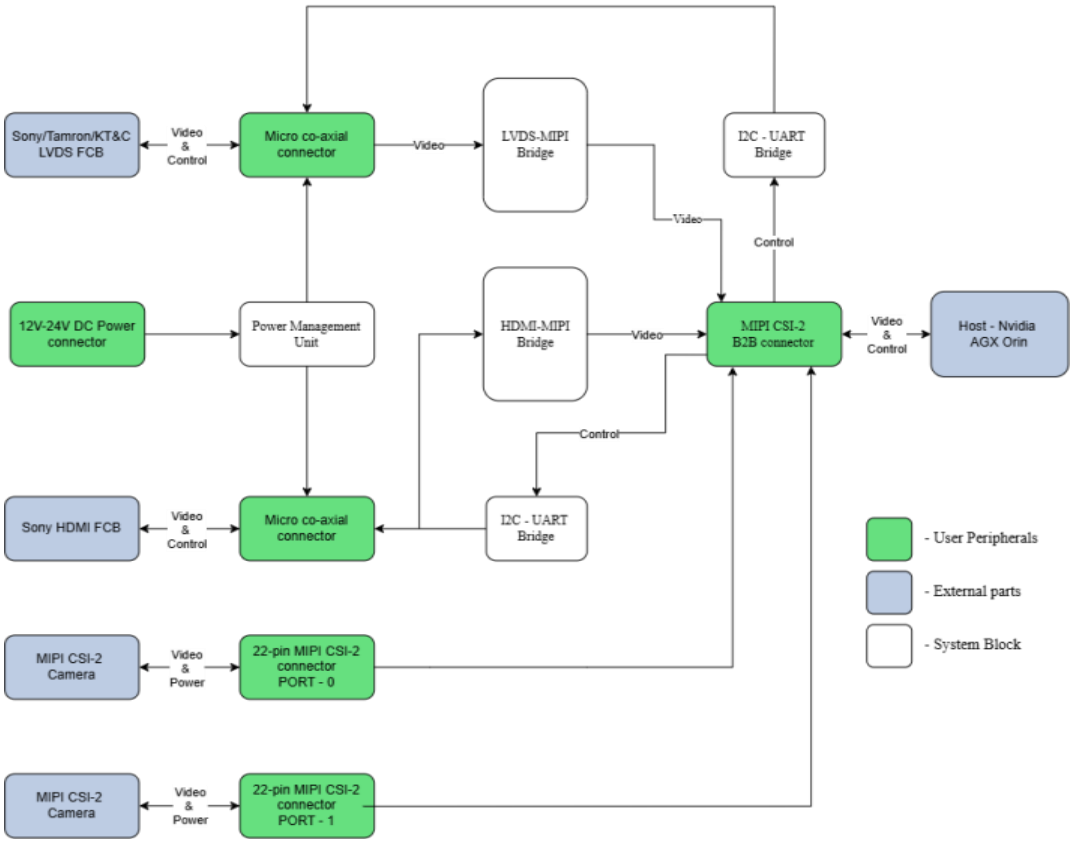
| PARAMETER | DETAILS |
|---|---|
| Connector Type | 22-pin FPC, straight, 4-lane MIPI CSI-2 |
| Signal Path | Direct pass-through — no protocol conversion |
| Compatibility | Any native MIPI CSI-2 camera / sensor module (4-lane) |

### PORT 4 — Native MIPI CONNECTOR - 1

| PARAMETER | DETAILS |
|---|---|
| Connector Type | 22-pin FPC, straight, 4-lane MIPI CSI-2 |
| Signal Path | Direct pass-through — no protocol conversion |
| Compatibility | Any native MIPI CSI-2 camera / sensor module (4-lane) |

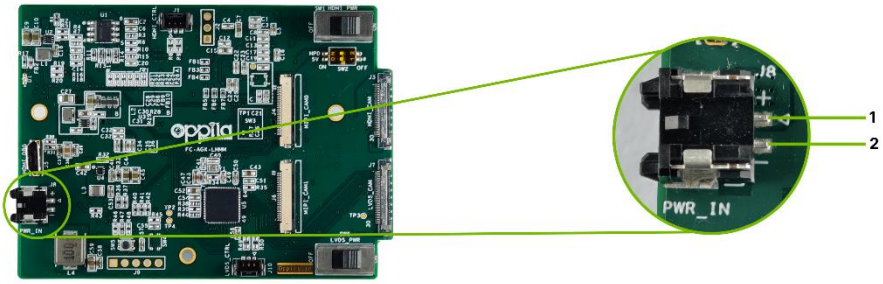
# System Architecture

## BOARD BLOCK DIAGRAM



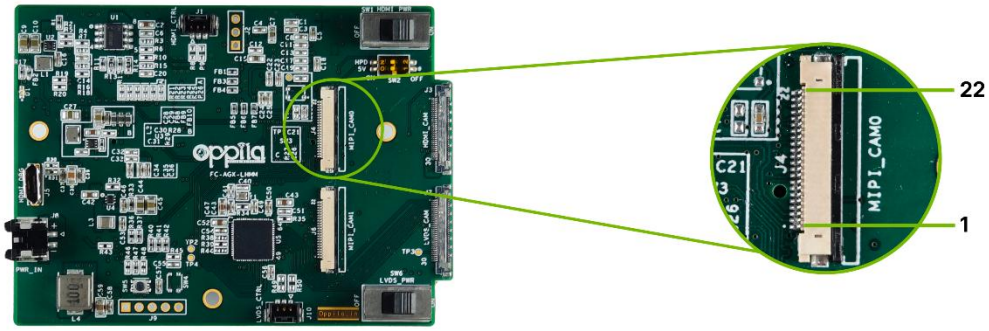

# Pinout Descriptions

## POWER CONNECTOR — J8




| PIN | SIGNAL |
|---|---|
| Pin 1 | +VIN |
| Pin 2 | GND |

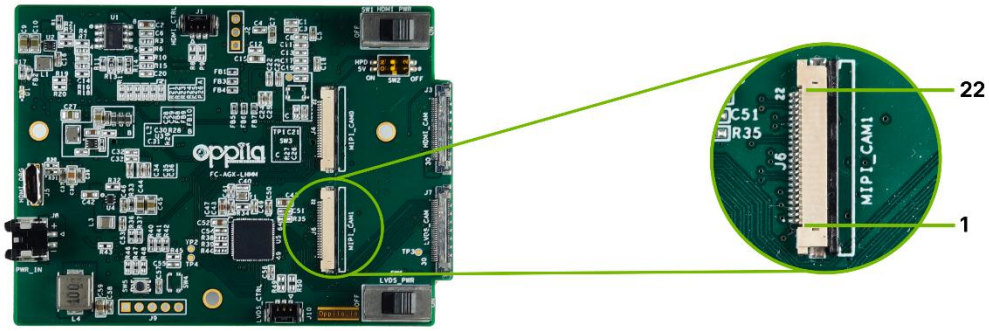
## MIPI CSI - 2 CAMERA CONNECTOR PORT 0 — J4




| PIN | SIGNAL |
|---|---|
| Pin 1 | 3V3 |
| Pin 2 | I2C_DATA |
| Pin 3 | I2C_CLK |
| Pin 4 | GND |
| Pin 5 | CAM0_MCLK |
| Pin 6 | CAM0_POWER DOWN |
| Pin 7 | GND |
| Pin 8 | CSI_5_D1_P |
| Pin 9 | CSI_5_D1_N |
| Pin 10 | GND |
| Pin 11 | CSI_5_D0_P |

| PIN | SIGNAL |
|---|---|
| Pin 12 | CSI_5_D0_N |
| Pin 13 | GND |
| Pin 14 | CSI_4_CLK_P |
| Pin 15 | CSI_4_CLK_N |
| Pin 16 | GND |
| Pin 17 | CSI_4_D1_P |
| Pin 18 | CSI_4_D1_N |
| Pin 19 | GND |
| Pin 20 | CSI_4_D0_P |
| Pin 21 | CSI_4_D0_N |
| Pin 22 | GND |

## MIPI CSI - 2 CAMERA CONNECTOR PORT 1— J6



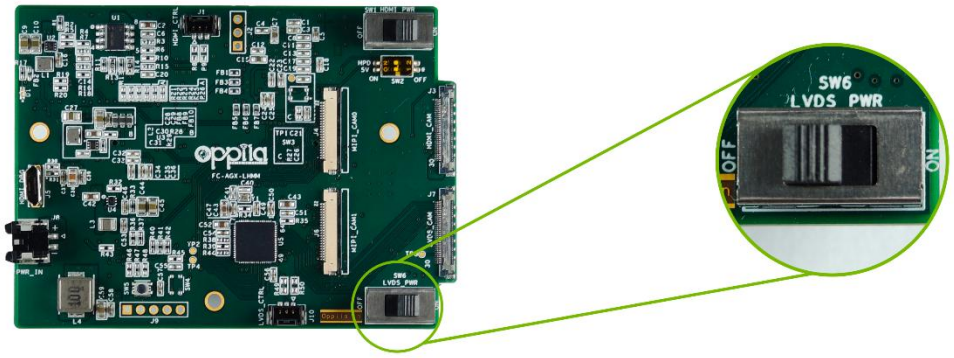

| PIN | SIGNAL |
|---|---|
| Pin 1 | 3V3 |
| Pin 2 | I2C_DATA |
| Pin 3 | I2C_CLK |
| Pin 4 | GND |

| PIN | SIGNAL |
|---|---|
| Pin 12 | CSI_7_D0_N |
| Pin 13 | GND |
| Pin 14 | CSI_6_CLK_P |
| Pin 15 | CSI_6_CLK_N |

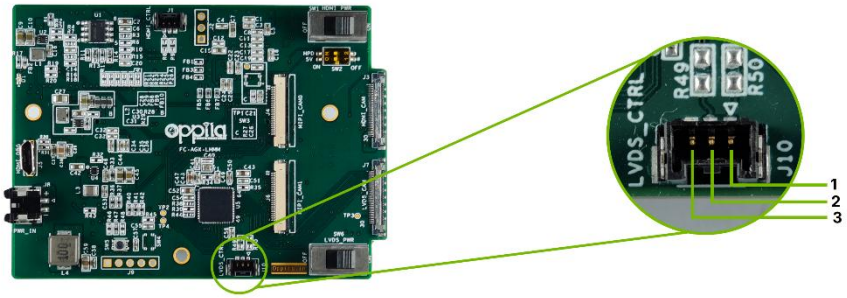
| | |
|---|---|
| Pin 5 | CAM1_MCLK |
| Pin 6 | CAM1_POWER DOWN |
| Pin 7 | GND |
| Pin 8 | CSI_7_D1_P |
| Pin 9 | CSI_7_D1_N |
| Pin 10 | GND |
| Pin 11 | CSI_7_D0_P |

| | |
|---|---|
| Pin 16 | GND |
| Pin 17 | CSI_6_D1_P |
| Pin 18 | CSI_6_D1_N |
| Pin 19 | GND |
| Pin 20 | CSI_6_D0_P |
| Pin 21 | CSI_6_D0_N |
| Pin 22 | GND |

## LVDS CAMERA POWER SWITCH — SW6

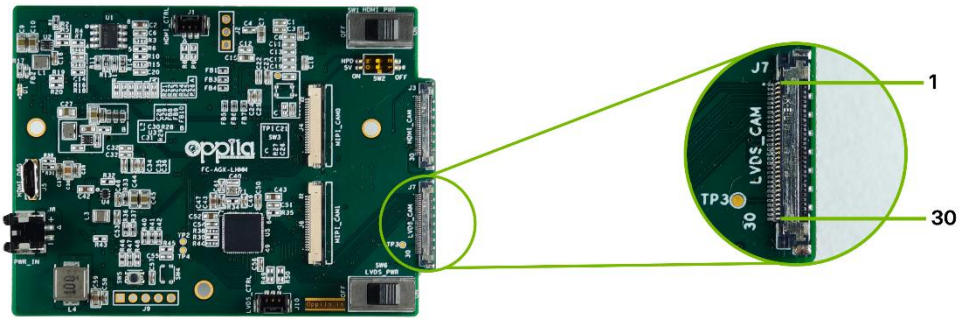



## LVDS CAMERA UART CONNECTOR — J10




| PIN | SIGNAL |
|---|---|
| Pin 1 | TX |
| Pin 2 | RX |
| Pin 3 | GND |

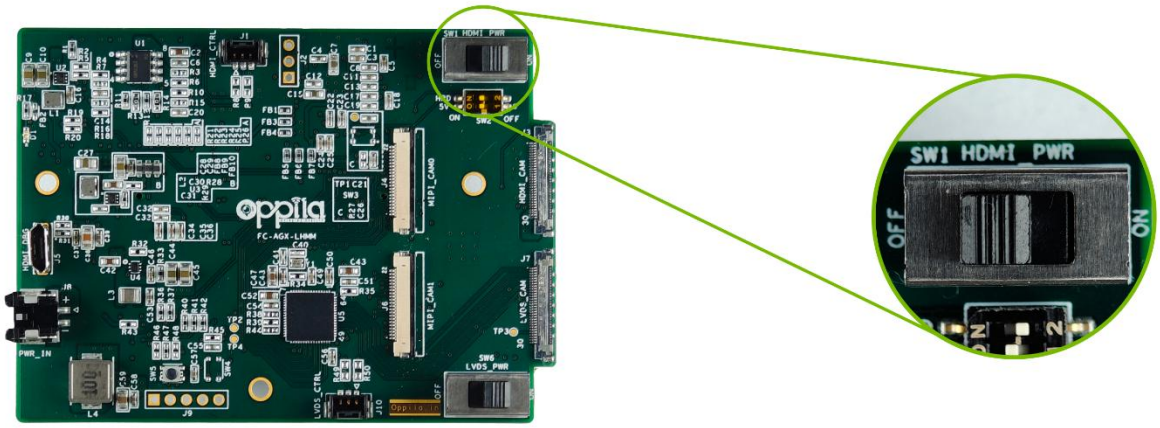
## LVDS CAMERA CONNECTOR — J7



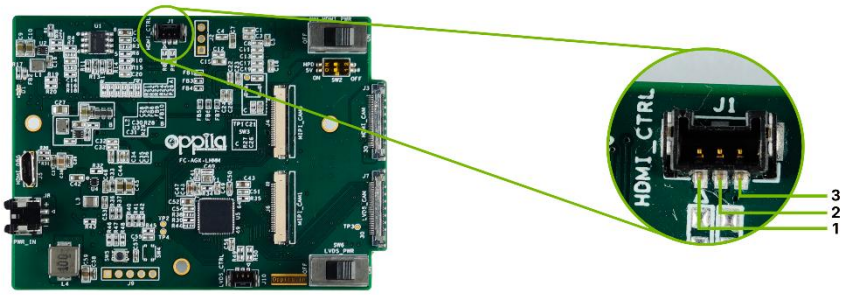

| PIN | SIGNAL |
|---|---|
| Pin 1 | LVDS_D3_P |
| Pin 2 | LVDS_D3_N |
| Pin 3 | LVDS_CLK_P |
| Pin 4 | LVDS_CLK_N |
| Pin 5 | LVDS_D2_P |
| Pin 6 | LVDS_D2_N |
| Pin 7 | LVDS_D1_P |
| Pin 8 | LVDS_D1_N |
| Pin 9 | LVDS_D0_P |
| Pin 10 | LVDS_D0_N |
| Pin 11 | GND |
| Pin 12 | CAM_TXD |
| Pin 13 | CAM_RXD |
| Pin 14 | DC_IN |
| Pin 15 | DC_IN |

| PIN | SIGNAL |
|---|---|
| Pin 16 | DC_IN |
| Pin 17 | DC_IN |
| Pin 18 | DC_IN |
| Pin 19 | GND |
| Pin 20 | GND |
| Pin 21 | NC |
| Pin 22 | NC |
| Pin 23 | NC |
| Pin 24 | NC |
| Pin 25 | NC |
| Pin 26 | RESET |
| Pin 27 | NC |
| Pin 28 | NC |
| Pin 29 | NC |
| Pin 30 | NC |

## HDMI CAMERA POWER SWITCH — SW1

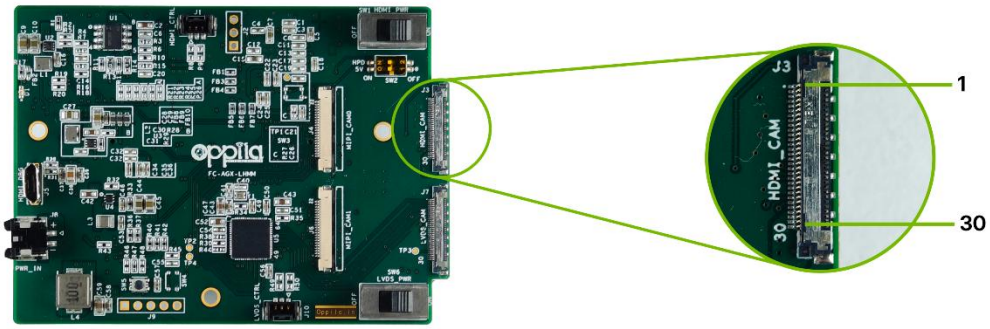


## HDMI CAMERA UART CONNECTOR — J1




| PIN | SIGNAL |
|---|---|
| Pin 1 | TX |
| Pin 2 | RX |
| Pin 3 | GND |

## HDMI CAMERA CONNECTOR — J3



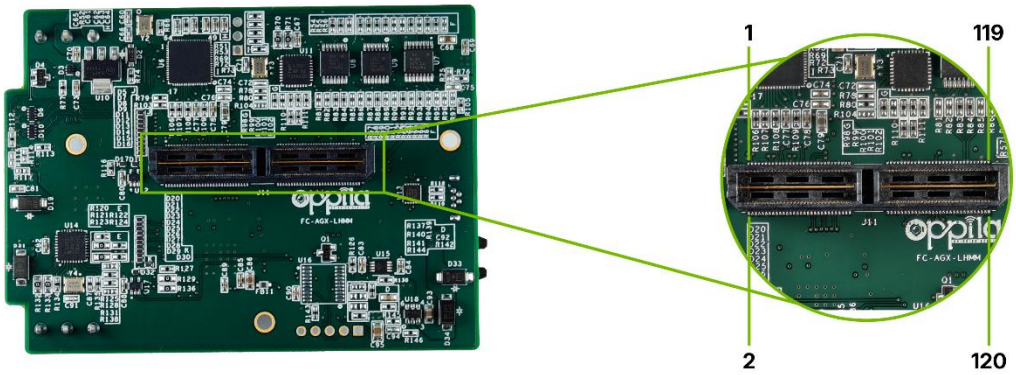

| PIN | SIGNAL |
|---|---|
| Pin 1 | GND |
| Pin 2 | HDMI_CLK_N |
| Pin 3 | HDMI_CLK_P |
| Pin 4 | GND |
| Pin 5 | HDMI_D0_N |
| Pin 6 | HDMI_D0_P |
| Pin 7 | GND |
| Pin 8 | HDMI_D1_N |
| Pin 9 | HDMI_D1_P |
| Pin 10 | GND |
| Pin 11 | HDMI_D2_N |
| Pin 12 | HDMI_D2_P |
| Pin 13 | GND |

| PIN | SIGNAL |
|---|---|
| Pin 16 | NC |
| Pin 17 | HDP / NC |
| Pin 18 | HDP_5V / NC |
| Pin 19 | GND / NC |
| Pin 20 | GND / NC |
| Pin 21 | NC |
| Pin 22 | NC |
| Pin 23 | GND / NC |
| Pin 24 | CAM_RXD |
| Pin 25 | CAM_TXD |
| Pin 26 | NC |
| Pin 27 | DC_IN |
| Pin 28 | DC_IN |

| | |
|---|---|
| Pin 14 | NC |
| Pin 15 | NC |

| | |
|---|---|
| Pin 29 | DC_IN |
| Pin 30 | DC_IN |

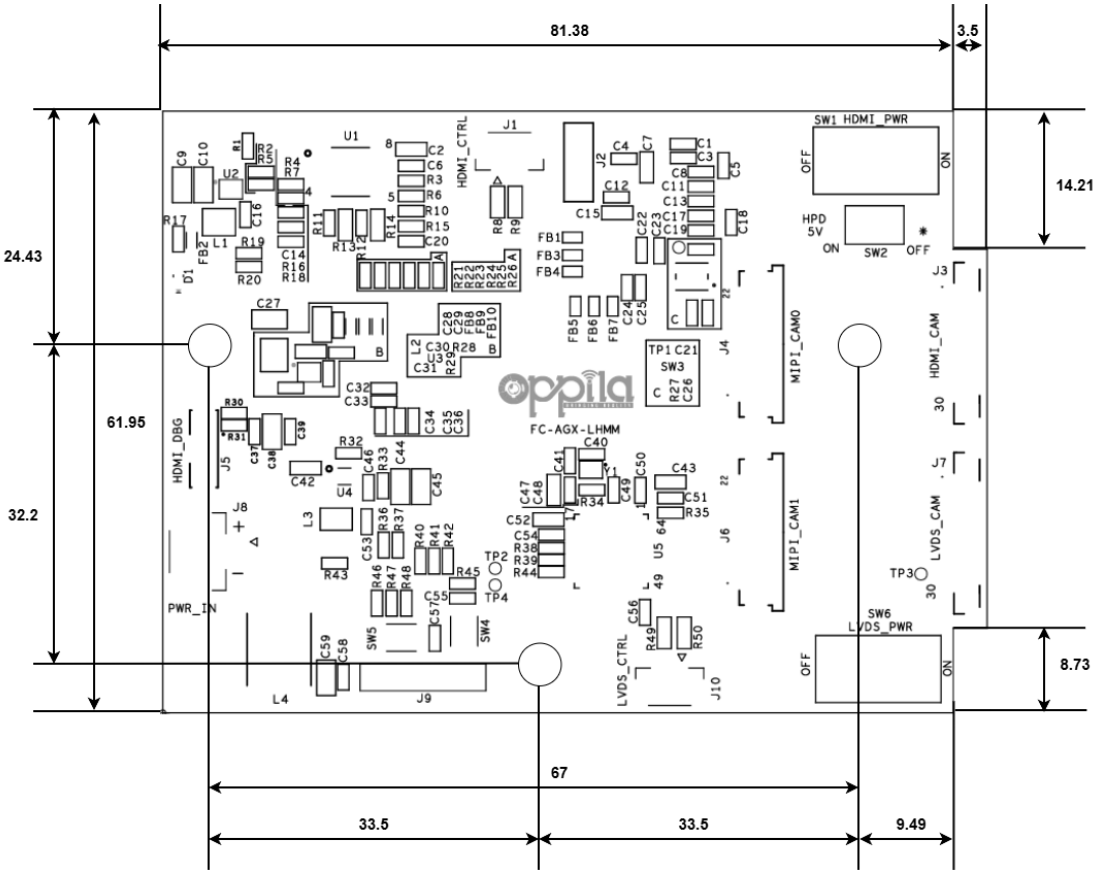
## MIPI CSI - 2 CAMERA CONNECTOR — J11




| PIN | SIGNAL | PIN | SIGNAL |
|---|---|---|---|
| Pin 1 | CSI_0_D0_P | Pin 31 | CSI_2_D1_P |
| Pin 2 | CSI_1_D0_P | Pin 32 | CSI_3_D1_P |
| Pin 3 | CSI_0_D0_N | Pin 33 | CSI_2_D1_N |
| Pin 4 | CSI_1_D0_N | Pin 34 | CSI_3_D1_N |
| Pin 5 | GND | Pin 35 | GND |
| Pin 6 | GND | Pin 36 | GND |
| Pin 7 | CSI_0_CLK_P | Pin 37 | CSI_4_D0_P |
| Pin 8 | NC | Pin 38 | CSI_6_D0_P |
| Pin 9 | CSI_0_CLK_N | Pin 39 | CSI_4_D0_N |
| Pin 10 | NC | Pin 40 | CSI_6_D0_N |
| Pin 11 | GND | Pin 41 | GND |
| Pin 12 | GND | Pin 42 | GND |
| Pin 13 | CSI_0_D1_P | Pin 43 | CSI_4_CLK_P |
| Pin 14 | CSI_1_D1_P | Pin 44 | CSI_6_CLK_P |
| Pin 15 | CSI_0_D1_N | Pin 45 | CSI_4_CLK_N |
| Pin 16 | CSI_1_D1_N | Pin 46 | CSI_6_CLK_N |
| Pin 17 | GND | Pin 47 | GND |
| Pin 18 | GND | Pin 48 | GND |
| Pin 19 | CSI_2_D0_P | Pin 49 | CSI_4_D1_P |
| Pin 20 | CSI_3_D0_P | Pin 50 | CSI_6_D1_P |
| Pin 21 | CSI_2_D0_N | Pin 51 | CSI_4_D1_N |
| Pin 22 | CSI_3_D0_N | Pin 52 | CSI_6_D1_N |
| Pin 23 | GND | Pin 53 | GND |
| Pin 24 | GND | Pin 54 | GND |
| Pin 25 | CSI_2_CLK_P | Pin 55 | NC |
| Pin 26 | NC | Pin 56 | NC |
| Pin 27 | CSI_2_CLK_N | Pin 57 | NC |
| Pin 28 | NC | Pin 58 | NC |
| Pin 29 | GND | Pin 59 | CSI_5_D0_P |
| Pin 30 | GND | Pin 60 | CSI 7 D0 P |

| PIN | SIGNAL | PIN | SIGNAL |
|---|---|---|---|
| Pin 61 | CSI_5_D0_N | Pin 91 | CAM0_MCLK |
| Pin 62 | CSI_7_D0_N | Pin 92 | HDMI_CAM_RST |
| Pin 63 | GND | Pin 93 | CAM0_PWDN |
| Pin 64 | GND | Pin 94 | NC |
| Pin 65 | NC | Pin 95 | LVDS_CAM_RST |
| Pin 66 | NC | Pin 96 | NC |
| Pin 67 | NC | Pin 97 | NC |
| Pin 68 | NC | Pin 98 | NC |
| Pin 69 | GND | Pin 99 | GND |
| Pin 70 | GND | Pin 100 | GND |
| Pin 71 | CSI_5_D1_P | Pin 101 | NC |
| Pin 72 | CSI_7_D1_P | Pin 102 | NC |
| Pin 73 | CSI_5_D1_N | Pin 103 | NC |
| Pin 74 | CSI_7_D1_N | Pin 104 | NC |
| Pin 75 | I2C_GP3_CLK | Pin 105 | I2C_GP9_CLK |
| Pin 76 | NC | Pin 106 | NC |
| Pin 77 | I2C_GP3_DAT | Pin 107 | I2C_GP9_DAT |
| Pin 78 | NC | Pin 108 | NC |
| Pin 79 | GND | Pin 109 | NC |
| Pin 80 | GND | Pin 110 | NC |
| Pin 81 | NC | Pin 111 | NC |
| Pin 82 | NC | Pin 112 | NC |
| Pin 83 | NC | Pin 113 | NC |
| Pin 84 | NC | Pin 114 | NC |
| Pin 85 | NC | Pin 115 | GND |
| Pin 86 | NC | Pin 116 | GND |
| Pin 87 | I2C_GP2_CLK | Pin 117 | NC |
| Pin 88 | CAM1_MCLK | Pin 118 | NC |
| Pin 89 | I2C_GP2_DAT | Pin 119 | NC |
| Pin 90 | CAM1 PWDN | Pin 120 | NC |

## MECHANICAL DETAILS




## KIT CONTAINS

| CATEGORY | PARAMETER | DETAILS |
|---|---|---|
| Standard package | Bridge Board | AGX ORIN MIPI CSI-2 Camera bridge board |
| | Power Cable | Crimped 2-pin DC power cable |
| | Documentation | Product datasheet (digital copy) |
| Optional accessories | Co-axial Cable | 30-pin micro-coaxial cable (optional) |
| | FPC Cable | 22-pin MIPI CSI-2 FPC cable (optional) |
| | Mounting Hardware | Screws and spacers for camera mounting (optional) |

**For more details**: AGX MIPI CSI-2 Bridge Board [LHMM] Documentation

## CONTACT US

For custom product requirements, please reach out:

**Purchase Support:** info@oppila.in
**Technical Support:** support@oppila.in