

# AGX ORIN 4-Channel MIPI CSI-2 Interposer Board

P/No: FC-AGX-LGHM



## Compatible Cameras:

- ▶ LVDS Cameras
  - Sony • Tamron • KT&C • Videology • Wonwoo • Skoopia
- ▶ HDMI Cameras
  - Sony HDMI Block Cameras
- ▶ GSML3 Cameras
- ▶ 22-pin MIPI CSI-2 Cameras (Raspberry Pi 5 pinout)

## Supported Host Platforms:

- NVIDIA Jetson AGX Orin Developer Kit

## KEY FEATURES

- **Multi-Interface Camera Integration:** Integrates LVDS–MIPI–MIPI–CSI-2, HDMI–MIPI–CSI-2, 2-channel GSML3–MIPI CSI-2, and 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 I<sup>2</sup>C-to-UART bridge (3.3V CMOS) for VISCA control, with provision for external onboard UART header for camera control
- **HDMI Camera Interface**
  1. Converts HDMI camera video output to 4-lane MIPI CSI-2
  2. Independent Camera power switch and I<sup>2</sup>C-to-UART bridge (3.3V CMOS) for VISCA control, with provision for external onboard UART header for camera control
- **GSML3 Camera Interface**
  1. Onboard GSML3 de-serializer aggregates two camera links into a single 4-lane CSI-2 output
  2. Power over Coax (PoC) support
  3. Backward compatible with GSML2 cameras
  4. MATE-AX dual coax connectors with breakout cables to FAKRA
- **Native MIPI CSI-2 Interface**
  1. 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: 38.4 g
  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, GMSL3, and 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 I<sup>2</sup>C-to-UART bridge (3.3V CMOS) for VISCA control, with an onboard header available for external camera control when needed. For longer-reach and multi-camera deployments, the board's GMSL3 interface aggregates two independent camera links into a single 4-lane CSI-2 output through an onboard de-serializer. It supports Power over Coax, so camera power and data ride the same cable, and remains backward compatible with GMSL2 cameras — giving flexibility across sensor generations. MATE-AX dual coax connectors, paired with breakout cables to FAKRA, keep cabling clean and serviceable in the field. Rounding out the interface set, a 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 38.4g 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, GMSL3, and native MIPI camera sources on a single Jetson AGX Orin platform.

## Technical specification

| PARAMETER                          | DETAILS                                                                                                                                                                                                                                                                         |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Input Voltage</b>               | 12–24 V DC regulated, wide-input (Molex Micro Fit+ 2-pin connector)                                                                                                                                                                                                             |
| <b>Camera Interface</b>            | 4 independent ports: LVDS–MIPI CSI-2 (30-pin KEL, LVDS Single mode), HDMI–MIPI CSI-2 (30-pin KEL, HDMI), 2-ch GMSL–MIPI CSI-2 (MATE-AX dual coax), native MIPI CSI-2 (22-pin FPC)                                                                                               |
| <b>MIPI CSI-2 Output</b>           | AGX Orin camera expansion connector compatible — 120-pin Samtec QTH-060 series, 16-lane MIPI CSI-2                                                                                                                                                                              |
| <b>I<sup>2</sup>C Architecture</b> | 3 independent I <sup>2</sup> C MUX ICs, each dedicated to a camera port group: TCA9544 for LVDS camera + control, TCA9543 for HDMI camera + control, TCA9542 for native MIPI. GMSL3 connects directly to the host I <sup>2</sup> C bus, bypassing the MUX architecture entirely |
| <b>Supported Video Format</b>      | Up to Full HD 4K 60fps (camera dependent)                                                                                                                                                                                                                                       |
| <b>Camera Control</b>              | VISCA over UART (3.3 V CMOS) bridged to I <sup>2</sup> C (host) for LVDS/HDMI ports                                                                                                                                                                                             |
| <b>Indicators</b>                  | Power LED (Green)                                                                                                                                                                                                                                                               |
| <b>Board Dimensions (L × W)</b>    | 84.87 × 61.95 mm                                                                                                                                                                                                                                                                |
| <b>Weight</b>                      | 38.4 g                                                                                                                                                                                                                                                                          |
| <b>Operating Temperature</b>       | –20 °C to +85 °C                                                                                                                                                                                                                                                                |
| <b>Compliance</b>                  | MIPI CSI-2 Specification, RoHS                                                                                                                                                                                                                                                  |
| <b>Recommended Supply</b>          | 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 I <sup>2</sup> C (host) via I <sup>2</sup> C 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 I <sup>2</sup> C (host) via I <sup>2</sup> C multiplexer |

### PORT 3 — 2-Channel GSML3 TO MIPI CSI-2 BRIDGE

| PARAMETER              | DETAILS                                                          |
|------------------------|------------------------------------------------------------------|
| Channels               | 2 x GMSL camera links                                            |
| De-serializer Output   | Aggregated to a single 4-lane MIPI CSI-2 output                  |
| Camera Power           | Power-over-Coax (PoC) supported for remote camera power delivery |
| Supported Video Format | Up to 1080p / 4K per channel (link budget and camera dependent)  |

### PORT 4 — DIRECT MIPI CSI-2 Connector

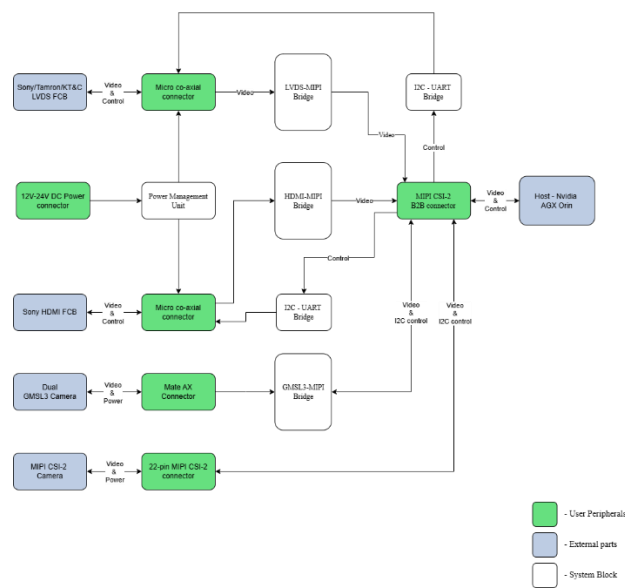
| PARAMETER      | DETAILS                                               |
|----------------|-------------------------------------------------------|
| Connector Type | 22-pin FPC, straight, 4-lane MIPI CSI-2               |
| Signal Path    | Direct pass-through — no protocol conversion          |
|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

### KIT CONTAINS

| CATEGORY             | PARAMETER         | DETAILS                                                      |
|----------------------|-------------------|--------------------------------------------------------------|
| Standard package     | Bridge Board      | AGX ORIN 4-channel MIPI CSI-2 Camera Interposer 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                                   |
|                      | FPC Cable         | 22-pin MIPI CSI-2 FPC cable                                  |
|                      | Mounting Hardware | Screws and spacers for camera mounting (optional)            |

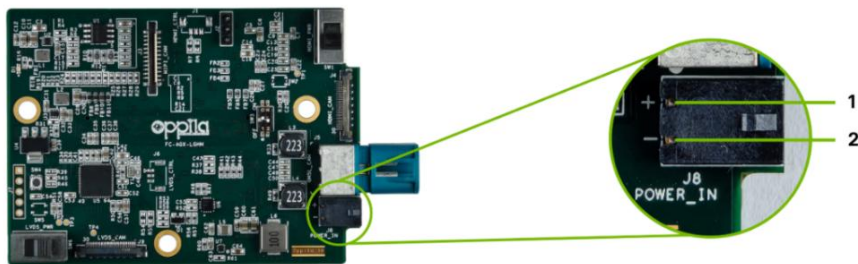
System Architecture

BOARD BLOCK DIAGRAM



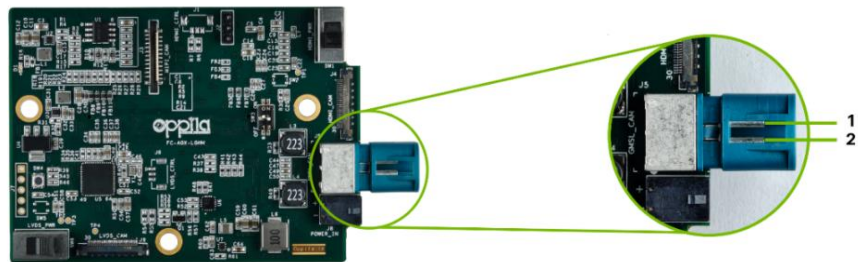
Pinout Descriptions

POWER CONNECTOR — J8



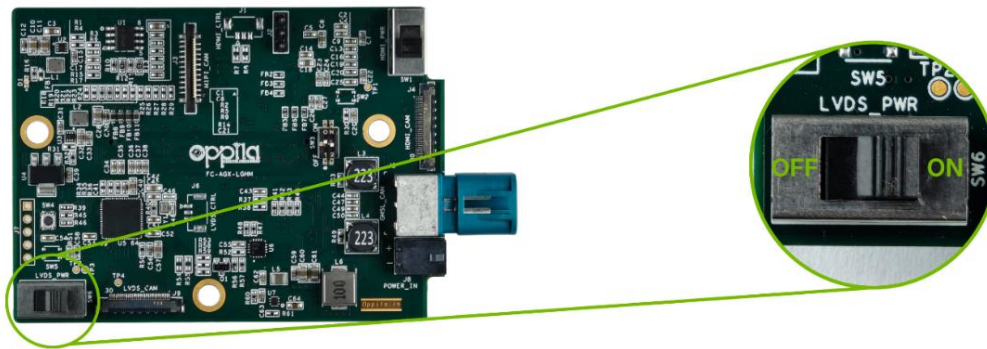
| PIN   | SIGNAL |
|-------|--------|
| Pin 1 | +VIN   |
| Pin 2 | GND    |

GMSL Camera Connector — J5

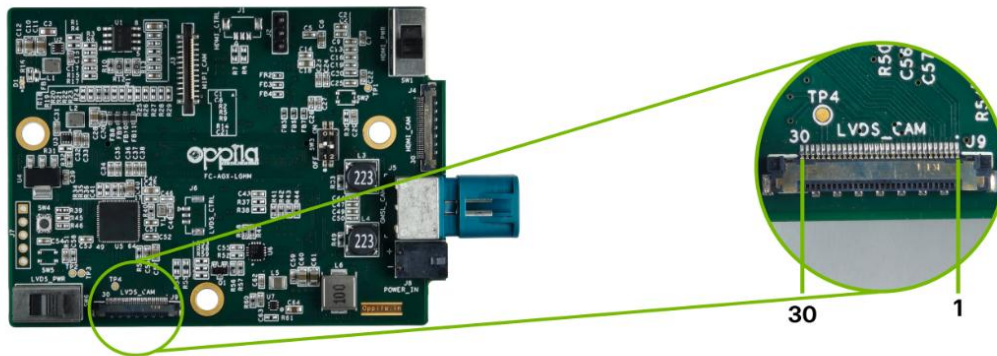


| PIN   | SIGNAL     |
|-------|------------|
| Pin 1 | GMSL3 CAM1 |
| Pin 2 | GMSL3 CAM2 |

## LVDS CAMERA POWER SWITCH — SW6



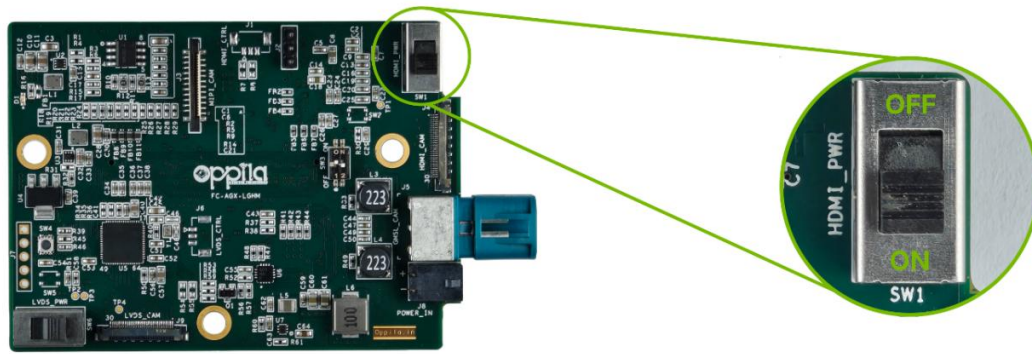
## LVDS CAMERA CONNECTOR — J9



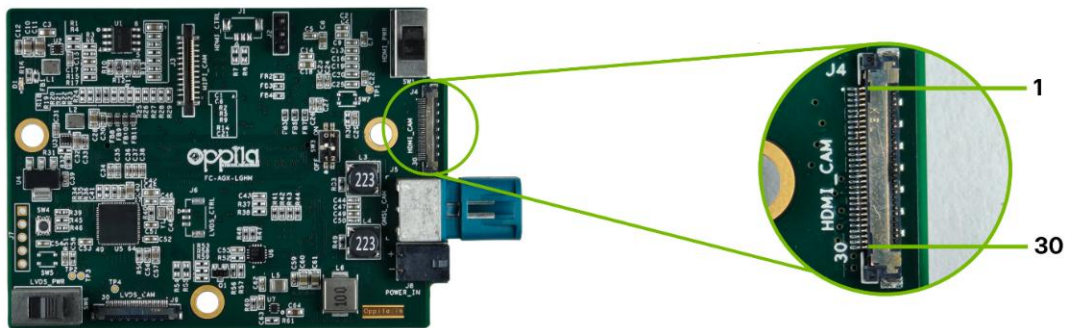
| PIN    | SIGNAL     |
|--------|------------|
| Pin 1  | LVDS_D3_P  |
| Pin 2  | LVDS_D3_N  |
| Pin 3  | LVDS_CLK_P |
| Pin 4  | LVDS_CLK_N |
| Pin 5  | LVDS_D2_P  |
| Pin 6  | LVDS_D2_N  |
| Pin 7  | LVDS_D1_P  |
| Pin 8  | LVDS_D1_N  |
| Pin 9  | LVDS_D0_P  |
| Pin 10 | LVDS_D0_N  |
| Pin 11 | GND        |
| 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



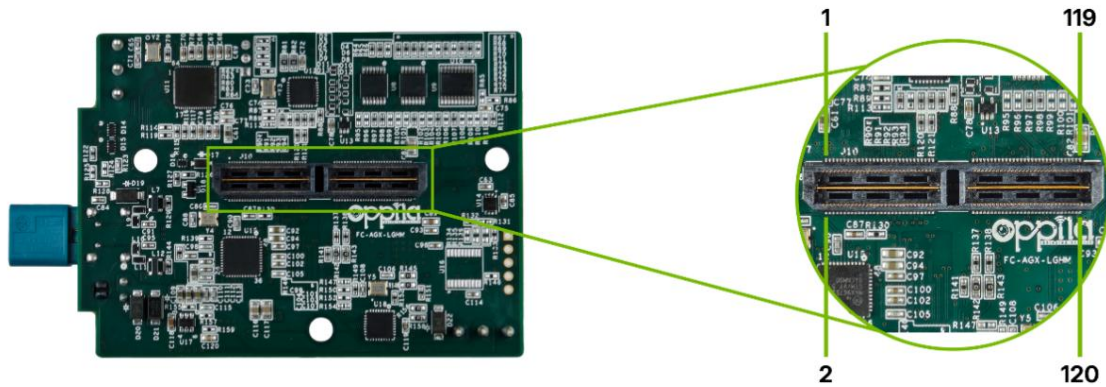
## HDMI CAMERA CONNECTOR — J4



| 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 14 | NC         |
| Pin 15 | NC         |

| 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 29 | DC_IN       |
| Pin 30 | DC_IN       |

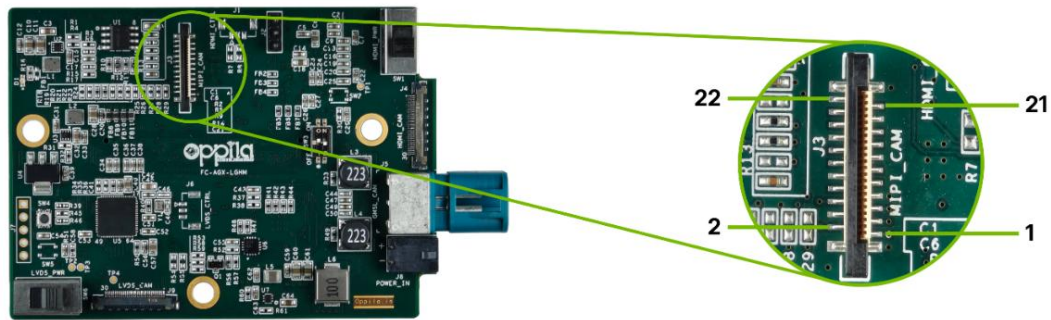
## MIPI CSI - 2 CAMERA EXPANSION CONNECTOR — J10



| 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  | NC          |
| Pin 62 | CSI_7_D0_N  | Pin 92  | NC          |
| Pin 63 | GND         | Pin 93  | NC          |
| Pin 64 | GND         | Pin 94  | NC          |
| Pin 65 | NC          | Pin 95  | NC          |
| 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 | NC          | Pin 118 | NC          |
| Pin 89 | I2C_GP2_DAT | Pin 119 | NC          |
| Pin 90 | NC          | Pin 120 | NC          |

## MIPI CSI - 2 CAMERA CONNECTOR — J3



| PIN    | SIGNAL     |
|--------|------------|
| Pin 1  | GND        |
| Pin 2  | CSI2_D0_N  |
| Pin 3  | CSI2_D0_P  |
| Pin 4  | GND        |
| Pin 5  | CSI2_D1_N  |
| Pin 6  | CSI2_D1_P  |
| Pin 7  | GND        |
| Pin 8  | CSI2_CLK_N |
| Pin 9  | CSI2_CLK_P |
| Pin 10 | GND        |
| Pin 11 | CSI2_D2_N  |

| PIN    | SIGNAL    |
|--------|-----------|
| Pin 12 | CSI2_D2_P |
| Pin 13 | GND       |
| Pin 14 | CSI2_D3_N |
| Pin 15 | CSI2_D3_P |
| Pin 16 | GND       |
| Pin 17 | NC        |
| Pin 18 | NC        |
| Pin 19 | GND       |
| Pin 20 | I2C_CLK   |
| Pin 21 | I2C_DATA  |
| Pin 22 | NC        |

## CONTACT US

For custom product requirements, please reach out:

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**Technical Support:** [support@oppila.in](mailto:support@oppila.in)