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> [ALINX AXU2CGB Zynq UltraScale+ MPSoC Development Board User Manual](#)

ALINX AXU2CGB

ALINX AXU2CGB Zynq UltraScale+ MPSoC Development Board User Manual

Model: AXU2CGB

1. INTRODUCTION

The ALINX AXU2CGB is a high-performance development board based on the AMD Zynq UltraScale+ MPSoC ZU2CG. This board is designed for advanced applications requiring significant processing power and programmable logic, such as Artificial Intelligence, Industrial IoT, 4K video processing, and high-speed data communication. It integrates a dual-core ARM Cortex-A53 and dual-core Cortex-R5 processor with 16nm FinFET+ technology, offering a robust platform for complex embedded systems development.

This manual provides essential information for setting up, operating, and maintaining your ALINX AXU2CGB development board. Please read it thoroughly before use to ensure proper functionality and to maximize the board's capabilities.

2. KEY FEATURES

- **Processor:** AMD Zynq UltraScale+ MPSoC ZU2CG with Dual-Core ARM Cortex-A53 and Dual-Core Cortex-R5.
- **Memory:** 2 GByte (64-bit) DDR4 SDRAM on PS, 32 MB QSPI Flash, 8 GB eMMC Flash.
- **Connectivity:** 1 x PCIe Gen2 x1 (PS), 1 x Gigabit Ethernet (PS), 4 x USB3.0 (PS).
- **Video & Display:** 1 x DP Interface (PS), 2 x 2-lane MIPI (PL).
- **Expansion:** 2 x 40-pin Expansion Ports, 1 x Micro SD slot.
- **Debugging:** 1 x UART on PS, JTAG port.
- **Applications:** Suitable for Artificial Intelligence, Video Processing, Industrial Control, Sensor Fusion, and IoT.

3. BOARD COMPONENTS OVERVIEW

Familiarize yourself with the various components and interfaces of the ALINX AXU2CGB development board.

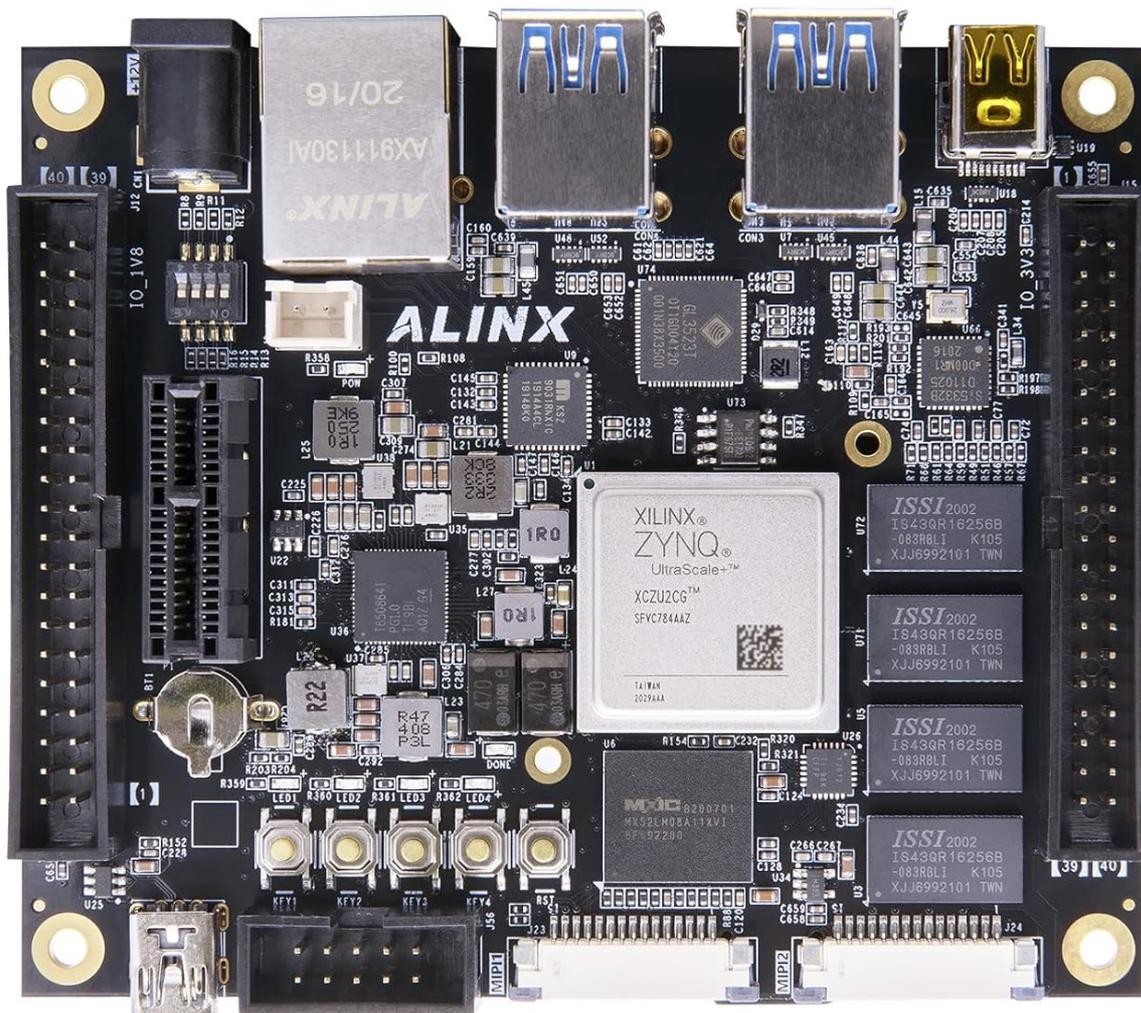


Figure 3.1: Top view of the ALINX AXU2CGB Development Board, showing the overall layout of components.

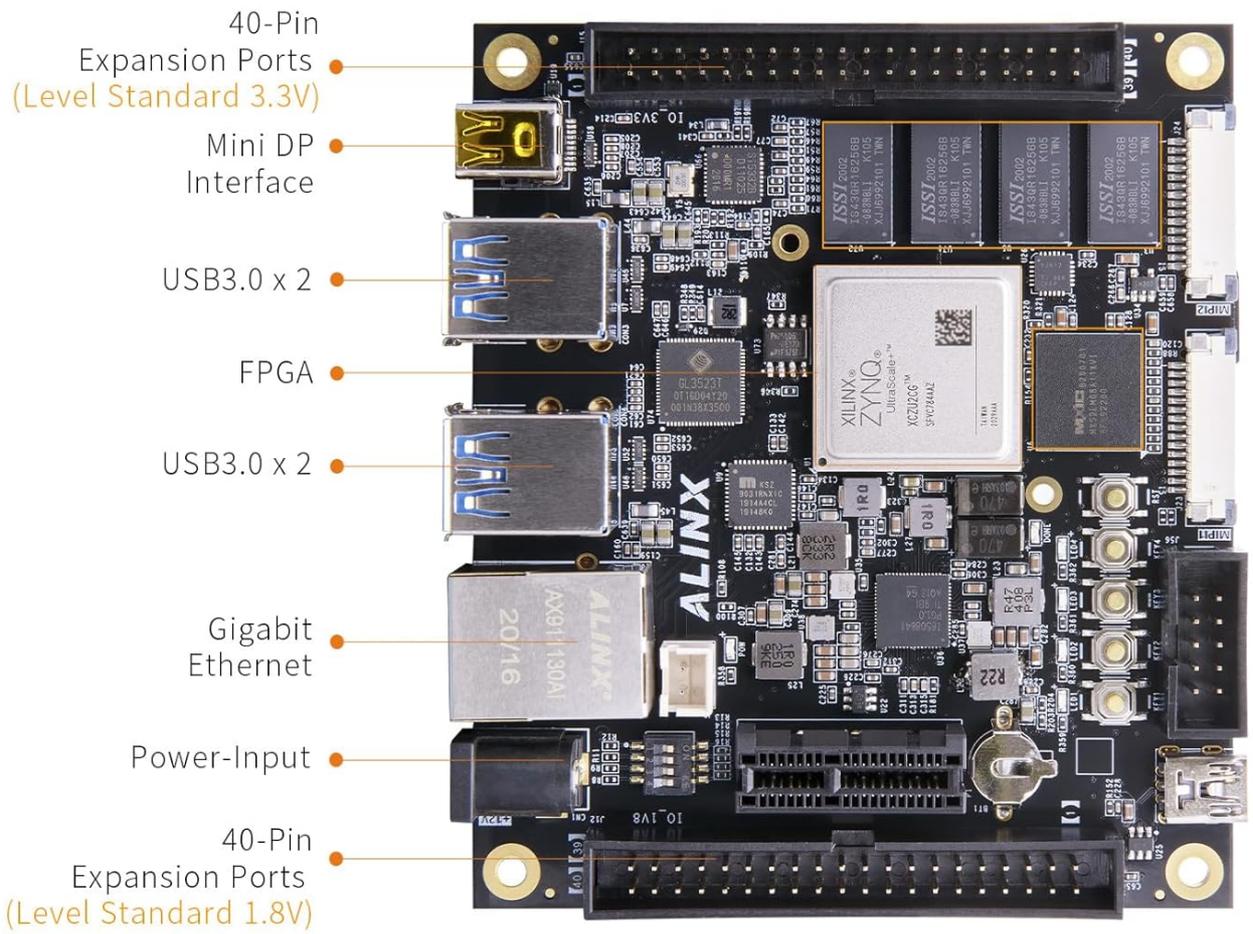


Figure 3.2: Detailed view of the top side components, including 40-Pin Expansion Ports (3.3V), Mini DP Interface, USB 3.0 ports, FPGA, Gigabit Ethernet, and Power Input.

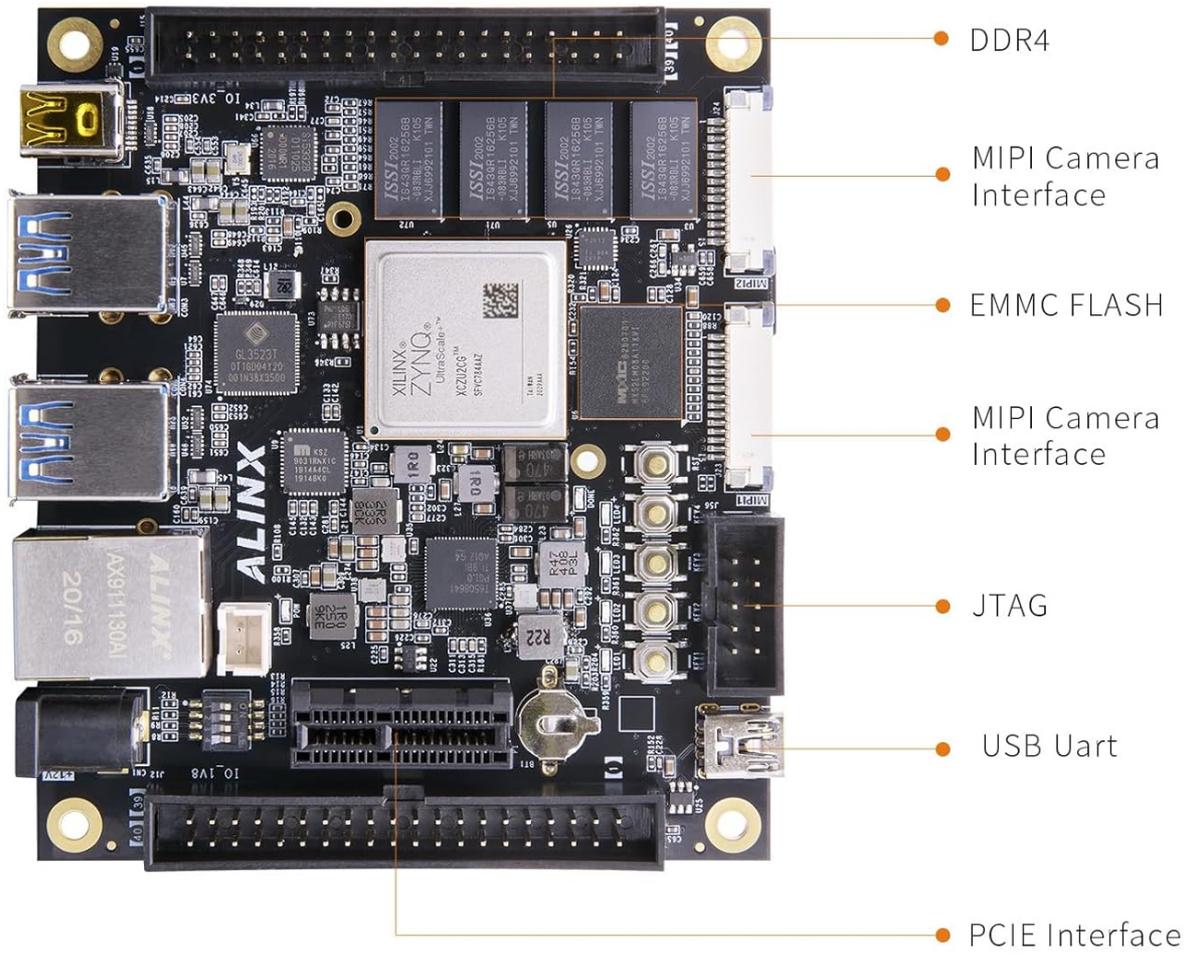


Figure 3.3: Further labeled components on the top side, highlighting DDR4 memory, MIPI Camera Interfaces, EMMC Flash, JTAG, USB UART, and PCIe Interface.

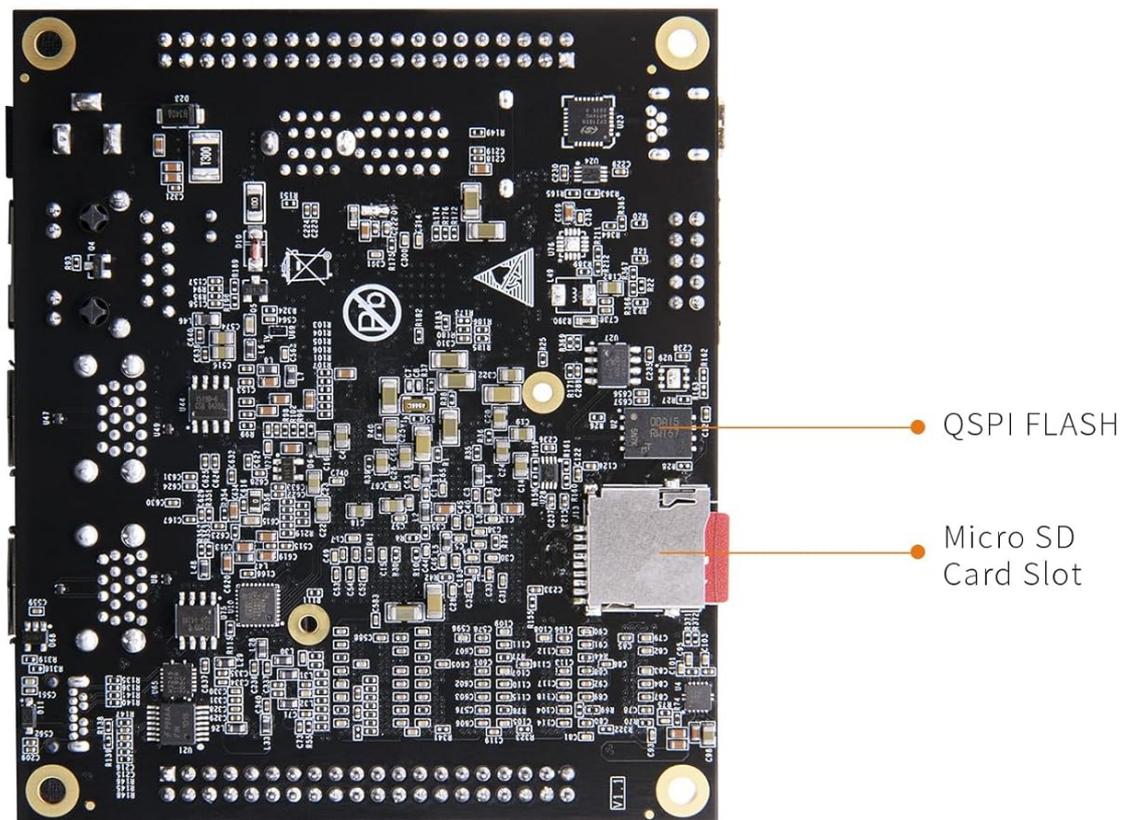


Figure 3.4: Bottom view of the ALINX AXU2CGB Development Board, showing the QSPI Flash and Micro SD Card Slot.

4. SETUP INSTRUCTIONS

Follow these steps to set up your ALINX AXU2CGB development board.

1. **Unpacking:** Carefully remove the development board and included accessories from the packaging. Ensure all components listed in the packing list are present.
2. **Power Connection:** Connect the appropriate power adapter to the board's power input port. Ensure the power supply meets the board's voltage and current requirements. (*Refer to specifications for details*).
3. **Cooling Fan Installation:** Attach the provided cooling fan to the designated area on the board. Ensure it is securely mounted and connected to the fan header.
4. **Peripheral Connections:**
 - Connect a display to the Mini DP Interface if visual output is required.
 - Connect a USB keyboard and mouse to the USB 3.0 ports for basic interaction.

- For network access, connect an Ethernet cable to the Gigabit Ethernet port.
 - Insert a Micro SD card into the Micro SD slot if external storage is needed.
5. **Software Environment:** Install the necessary development tools and SDKs (e.g., Xilinx Vitis, Vivado) on your host PC. Refer to the official ALINX documentation or Xilinx resources for detailed software setup guides.
 6. **First Power-On:** Once all connections are secure, apply power to the board. Observe the status LEDs for initial boot sequence.

5. OPERATING INSTRUCTIONS

This section outlines general operating procedures for the ALINX AXU2CGB development board.

5.1. Basic Operation

- **Power On/Off:** Use the power switch or disconnect the power adapter to power off the board. Always ensure proper shutdown procedures are followed to prevent data corruption.
- **System Boot:** The board will typically boot from the eMMC Flash or QSPI Flash. If a bootable image is present on the Micro SD card, it may boot from there depending on the boot mode settings.
- **Accessing the System:**
 - **Via DisplayPort:** If a display is connected, the graphical user interface (if available) will be shown.
 - **Via USB UART:** Connect a USB-to-serial adapter to the USB UART port and use a terminal emulator (e.g., PuTTY, Tera Term) on your host PC to access the serial console.
 - **Via Ethernet:** Access the board via SSH or other network protocols once an IP address is assigned.

5.2. Programming and Debugging

- **FPGA Programming:** Use Xilinx Vivado or Vitis to compile and load FPGA bitstreams onto the Zynq UltraScale+ PL (Programmable Logic) section.
- **Software Development:** Develop applications for the ARM processors using Xilinx Vitis IDE. This includes bare-metal applications, Linux-based applications, and AI acceleration with Vitis AI.
- **JTAG Debugging:** Connect a JTAG debugger to the JTAG port for hardware debugging of both the PS (Processing System) and PL.
- **Expansion Ports:** Utilize the 40-pin expansion ports to connect various ALINX modules, such as camera modules, TFT LCD screens, or custom peripherals.

6. MAINTENANCE

Proper maintenance ensures the longevity and reliable operation of your ALINX AXU2CGB development board.

- **Cleaning:** Keep the board clean and free from dust. Use a soft, dry brush or compressed air to remove dust from components and connectors. Avoid using liquids or abrasive cleaners.
- **Environmental Conditions:** Operate the board within the specified working temperature range (0°C to 70°C). Avoid extreme humidity, direct sunlight, or environments with excessive vibrations.
- **Firmware Updates:** Regularly check the ALINX official website for firmware, driver, and software updates. Keeping your board's software up-to-date can improve performance and stability.
- **Handling:** Always handle the board by its edges to avoid touching sensitive components. Use anti-static precautions (e.g., anti-static wrist strap) when handling to prevent electrostatic discharge (ESD) damage.
- **Storage:** When not in use, store the board in its original anti-static packaging or a suitable anti-static container in a cool, dry place.

7. TROUBLESHOOTING

This section provides solutions to common issues you might encounter.

Issue: Board does not power on.

- **Solution:** Verify the power adapter is correctly connected and providing the specified voltage and current. Check the power cable for damage. Ensure the power switch (if present) is in the ON position.

Issue: No display output via Mini DP.

- **Solution:** Ensure the display cable is securely connected to both the board and the monitor. Check if the monitor is set to the correct input source. Verify that the software running on the board is configured to output to the DisplayPort. An ALINX customized DP to HDMI cable may be required (sold separately).

Issue: USB devices are not recognized.

- **Solution:** Try connecting the USB device to a different USB 3.0 port. Ensure the device drivers are installed on the board's operating system (if applicable). Check the power consumption of the USB device; some high-power devices may require an external power source.

Issue: Cannot connect to the board via Ethernet.

- **Solution:** Verify the Ethernet cable is properly connected. Check network settings on both the board and your host PC. Ensure the board's operating system has the correct network drivers and configurations. Confirm that the network switch or router is functioning correctly.

Issue: FPGA programming fails.

- **Solution:** Ensure the JTAG cable is correctly connected and recognized by your development software (Vivado/Vitis). Verify that the bitstream file is valid and compatible with the ZU2CG device. Check for any error messages in the development environment for specific guidance.

8. TECHNICAL SPECIFICATIONS

Detailed technical specifications for the ALINX AXU2CGB development board.

8.1. Main Parameters Comparison (AXU2CGA vs AXU2CGB)

Main Parameters

| | AXU2CGA | AXU2CGB |
|-----------------------|--|-------------------------------------|
| FPGA Board | AXU2CGA | AXU2CGB |
| FPGA Chip | XCZU2CG-1SFVC784E | |
| Chip CPU | Dual-Core ARM Cortex-A53, 1.2GHz, Dual-Core ARM Cortex™-R5, 500MHz | |
| PS RAM | DDR4, 1GB 32bit, 2400Mbps | DDR4, 2GB 64bit, 2400Mbps |
| Chip Level | Commercial Grade | Commercial Grade |
| Working Temperature | 0°C to 70°C | 0°C to 70°C |
| Speed Grades | -1 | -1 |
| Logic Cells | 103K | 103K |
| CLB Flip-Flops | 94K | 94K |
| Look Up Tables (LUTs) | 47K | 47K |
| Global Clock | 3 | 3 |
| Multiplier | 240 | 240 |
| MAX. DISTRIBUTED RAM | 1.2Mb | 1.2Mb |
| BLOCK RAM | 5.3Mb | 5.3Mb |
| EMMC FLASH | / | 8GB |
| QSPI FLASH | 32MB | 32MB |
| HP I/O (1.8V) | 34 | 34 |

Figure 8.1: Comparison of key parameters between AXU2CGA and AXU2CGB models.

8.2. Interface and Function Overview

Interface and Function

| | |
|------------------------|--|
| DP Interface | Mini Display Port up to 4K@30Hz or 1080P@60Hz Output (ALINX customized DP to HDMI cable, need to buy Separately) |
| PCIE Interface | Used to Connect PCIE Peripherals, Communication Speed up to 5Gbps |
| MIPI Interface x 2 | Used to Connect ALINX MIPI Interface OV5640 Camera Module AN5641 |
| USB 3.0 x 4 | Used to Connect External USB Peripherals |
| USB Uart | Used for Serial Communication with PC or External Devices |
| Gigabit Ethernet | 10/100/1000M Ethernet with RJ-45 Interfaces for Data Exchange |
| System Clock | PS System Clock is 33.3333Mhz, PL Clock is 25Mhz (Not with Battery) |
| JTAG | 10-pin 0.1-inch Standard JTAG Port for Programs Debug and Download |
| EEPROM | EEPROM 24LC04 with IIC Interface On-Board |
| SD Card Slot | 1 Micro SD Card Slot, Support SD Mode and SPI Mode |
| LED | 5 User LEDs |
| KEYs | 5 KEYs, 1 Reset KEY, 4 User KEYs |
| 40-Pin Expansion Ports | Two 40-Pin Expansion Ports (0.1 inch Pitch), Can be Connect with Various ALINX Modules (Binocular Camera Module, TFT LCD Screen, Camera, AD/DA and Other Modules). |

Figure 8.2: Overview of interfaces and their functions on the ALINX AXU2CGB.

8.3. General Specifications

| Feature | Description |
|------------|--|
| Brand | ALINX |
| Model | AXU2CGB |
| Processor | AMD Zynq UltraScale+ MPSoC ZU2CG (Dual-Core ARM Cortex-A53, Dual-Core ARM Cortex-R5) |
| PS RAM | 2 GB DDR4 (64-bit) |
| QSPI Flash | 32 MB |
| eMMC Flash | 8 GB |

| Feature | Description |
|----------------------|------------------------------------|
| PCIe Interface | 1 x PCIe Gen2 x1 (PS) |
| Ethernet | 1 x Gigabit Ethernet (PS) |
| USB Ports | 4 x USB3.0 (PS) |
| Display Interface | 1 x DP Interface (PS) |
| MIPI Interface | 2 x 2-lane MIPI (PL) |
| Expansion Ports | 2 x 40-pin Expansion Ports |
| Micro SD | 1 x Micro SD Slot |
| UART | 1 x UART on PS |
| EEPROM | 1 x EEPROM (24LC04) on PS |
| JTAG | 10-pin 0.1-inch Standard JTAG Port |
| Dimensions (LxWxH) | 10.01 x 8.76 x 1.52 cm |
| Working Temperature | 0°C to 70°C |
| Included Accessories | Cooling Fan |

9. SUPPORT AND RESOURCES

For further assistance, documentation, and development resources, please refer to the following:

- **Official Documentation:** ALINX provides comprehensive resources including schematics, user manuals in PDF format, Verilog HDL demos, and experiment guidelines. These can typically be found on the official ALINX product page or support portal.
- **Xilinx Resources:** As the board is based on Zynq UltraScale+ MPSoC, Xilinx's official documentation, forums, and development tools (Vivado, Vitis, Vitis AI) are invaluable resources for development.
- **Technical Support:** For specific technical inquiries or issues not covered in this manual, please contact ALINX customer support through their official website.

