
Radxa Orion O6N Product Brief

Nano-ITX ARM AI PC

Revision 1.4

2025-11-27



Radxa Computer



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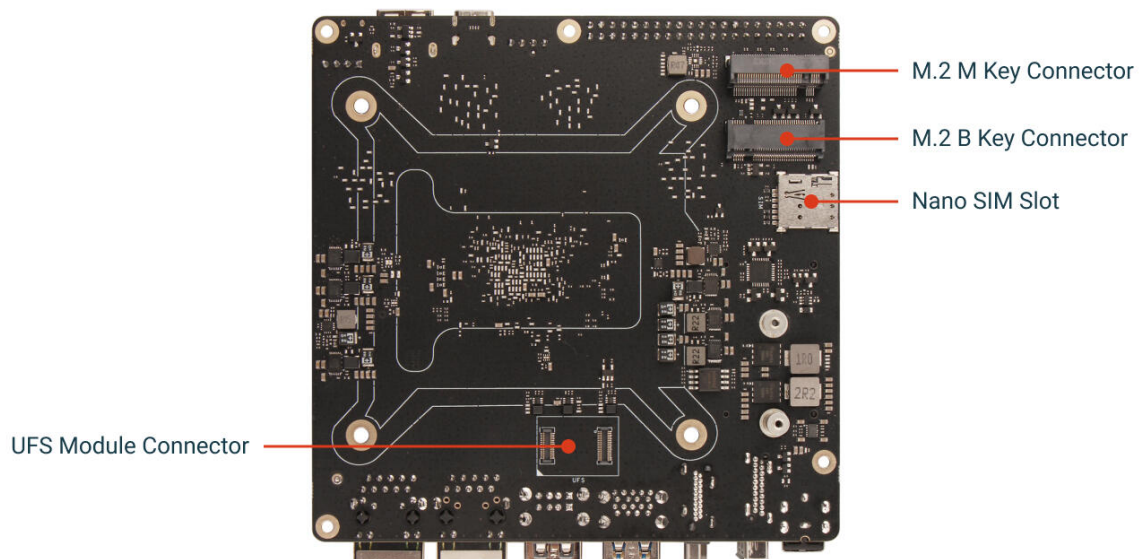
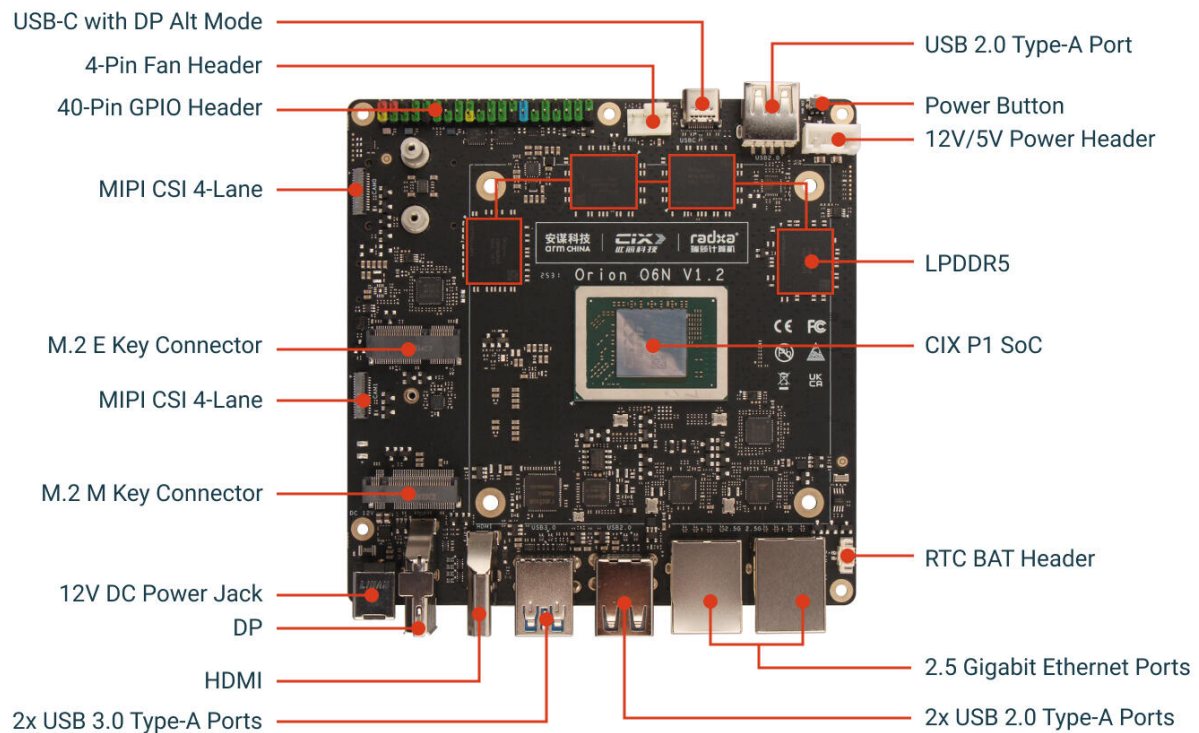
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1 Revision Control Table

Version	Date	Changes from previous version
1.0	2025/05/16	First version based on O6
1.1	2025/07/25	Add 2D dimensions
1.2	2025/09/11	Specification update
1.3	2025/10/12	Modify RTC battery header description
1.4	2025/11/27	Memory speed update

2 Introduction

The Radxa Orion O6N is a professional-grade Nano-ITX (120 x 120 mm) Single Board Computer designed for AI computing and multimedia applications. Powered by the Cix P1 SoC and featuring up to 64GB LPDDR5 RAM, it delivers server-class performance in a nano form factor. With comprehensive I/O options including triple display outputs, dual 2.5GbE networking, and PCIe Gen4 expansion, the Orion O6N is ideal for AI development workstations, edge computing nodes, and high-performance personal computing.



Note: The actual board layout or component locations may change over time, but the main connector types and their locations are expected to remain the same.

The Orion O6N bridges the gap between embedded computing and high-performance AI workstations, enabling developers to prototype and deploy advanced AI solutions on a compact ARM platform.

3 Features

Product Highlights

- Arm V9 CPU Architecture for balanced performance and efficiency
- Next-Gen AI Compute with 30 TOPs NPU
- 8K Multimedia Engine with AV1/H.265 hardware acceleration
- Comprehensive I/O with triple display outputs and dual 2.5GbE

3.1 Hardware

Processing Unit

- SoC: Cix P1 (6nm TSMC process)
 - 4x Cortex®-A720 (High-performance cores)
 - 4x Cortex®-A720 (Mid-performance cores, lower frequency)
 - 4x Cortex®-A520 (LITTLE cores)
 - 12MB shared L3 cache

Memory System

- RAM: LPDDR5
 - 128-bit memory bus
 - Optional 5000MT/s or 6000MT/s transfer speed
 - Configurations: 8GB/16GB/24GB/32GB/48GB/64GB

Graphics & Display

- GPU: Arm® Immortalis™-G720 MC10
 - Hardware Ray-Tracing enabled
 - Graphics APIs:
 - * Vulkan® 1.3
 - * OpenGL® ES 3.2
 - * OpenCL® 3.0
- Display Outputs:
 - 1x USB-C with DisplayPort Alt Mode
 - 1x HDMI port
 - 1x DisplayPort with MST support
 - Support for concurrent triple-display operation

Media Processing

- Hardware Decoder:
 - Resolution: Up to 8K@60fps
 - Formats: AV1, H.265, H.264, VP9, VP8, H.263, MPEG-4, MPEG-2
- Hardware Encoder:
 - Resolution: Up to 8K@30fps
 - Formats: H.265, H.264, VP9, VP8

AI Acceleration

- Neural Processing Unit (NPU)
 - Computing Power: 30 TOPs
 - Precision Support:
 - * INT4/INT8/INT16
 - * FP16
 - * TF32

With 30 TOPs AI processing and native 8K AV1/H.265 decoding, the O6N is ideal for AI-enhanced video analytics, smart surveillance, and real-time content processing.

3.2 Interfaces

3.2.1 Back Panel Connectors

- **DisplayPort™ 1.4**
 - Maximum output: up to 4K@120Hz
 - Supports MST (Multi-Stream Transport)
- **HDMI™ 2.0**
 - Maximum resolution: 4K@60Hz
 - HDMI CEC not supported
- **Ethernet**
 - 2x Multi-gigabit RJ45 ports
 - Speeds: 10/100/1000/2500 Mbps
- **USB Type-C™**
 - 1x USB 3.2 Gen 2 (10 Gbps) data
 - DisplayPort Alt Mode video output (up to 4K@60Hz)
- **USB Type-A Ports**

- 2x USB 3.2 Gen 2 (10 Gbps)
- 3x USB 2.0
- **DC Power Connector**
 - 12 V DC 5.5 × 2.5 mm (5525) barrel connector

A detailed I/O layout diagram is available in the hardware documentation for easy reference.

3.2.2 Internal Headers & Connectors

Power & System

- **Internal Power Connector**
 - 4-pin floppy power connector
- **Cooling System**
 - 4-pin CPU fan header with smart PWM control
 - Fan speed monitoring via TACH
 - 75 x 75 mm heatsink mounting holes

Storage & Expansion

- **2x M.2 SSD Slots (M-Key)**
 - PCIe Gen4 x4 lanes per slot
 - Supports high-performance NVMe SSDs
- **M.2 Wireless Slot (E-Key)**
 - PCIe Gen4 x2 lanes + USB
 - Perfect for WiFi 6E + Bluetooth modules
 - Backward compatible with WiFi 5/6 modules
- **M.2 Cellular Slot (B-Key)**
 - USB interface with Nano SIM card slot
 - Supports M.2 3042 4G LTE modules
- **UFS Module Expansion**
 - 1x UFS module connector for storage expansion

The PCIe Gen4 lanes allow expansion with high-performance NVMe SSDs, AI accelerators, GPUs, or high-speed network adapters, offering unmatched flexibility for developers.

Camera Support

- **Dual MIPI CSI camera interfaces**

- 2x MIPI CSI ports
- Configurable as 4-lane or 2-lane per port
- Ideal for AI vision applications

Maintenance & Debug

- **Real-Time Clock**

- On-board RTC Battery header
- Power-off time keeping

- **Debug Features**

- Serial console header
- System monitoring sensors

3.3 Software Support

Operating Systems

- Debian Linux distributions
- Android
- OpenHarmony
- Deepin Linux
- Fedora Linux
- Full UEFI support via EDKII
- BSP and SDK available

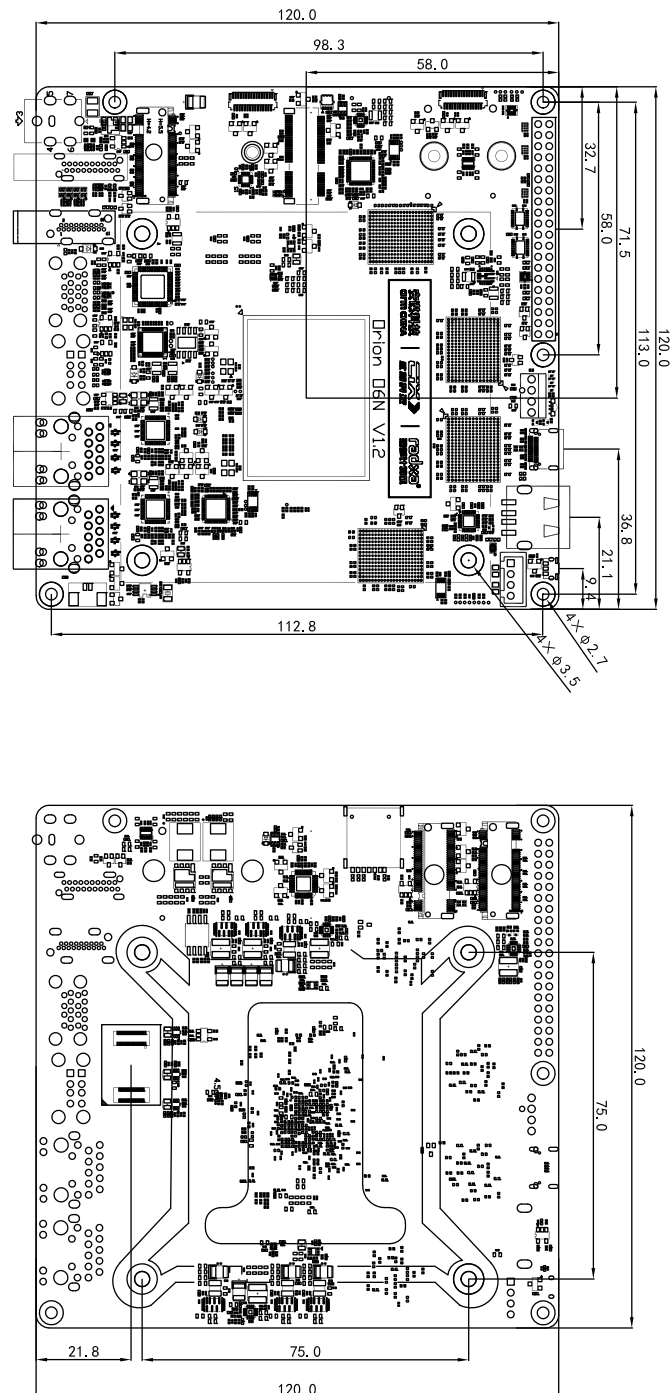
Pre-installed OS images available upon request. Official Debian images with BSP support can be downloaded from the Radxa website.

Development Resources

- Comprehensive hardware and software documentation
- Active community forum support
- Regular firmware & OS updates
- Open-source BIOS / EDKII and Linux kernel
- Official GitHub repositories and SDK download links

SDK includes C/C++ and Python APIs, as well as GStreamer plugins for multimedia processing.

4 Mechanical Specification



Board dimensions: 120 mm x 120 mm (Nano-ITX), PCB thickness 1.6 mm, maximum component height ~30 mm without heatsink.

5 Electrical Specification

5.1 Power Requirements

The Orion O6N supports multiple power input options, including a standard ATX PSU via the 4-pin floppy power connector and a 12 V DC input via a 5.5 × 2.5 mm (5525) barrel connector.

- Standard ATX PSU via the 4-pin floppy power connector
- 12 V DC 5.5 × 2.5 mm (5525) barrel connector

The recommended power source should provide at least 60 W (12 V / 5 A or higher).

Typical power consumption: Idle ~15 W, Full Load ~55 W (may vary by configuration).

Do not connect multiple power sources simultaneously; this may damage the board and the connected power supplies.

6 Availability

Radxa guarantees availability of the Radxa Orion O6N until at least September 2029.

7 Support

For support please see the hardware documentation section of the [Radxa Website](#) and post questions to the [Radxa forum](#).

