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# Radxa Cubie A7A Product Brief

New standard for affordable edge AI innovation

Revision 1.1

2025-08-29



Radxa Computer



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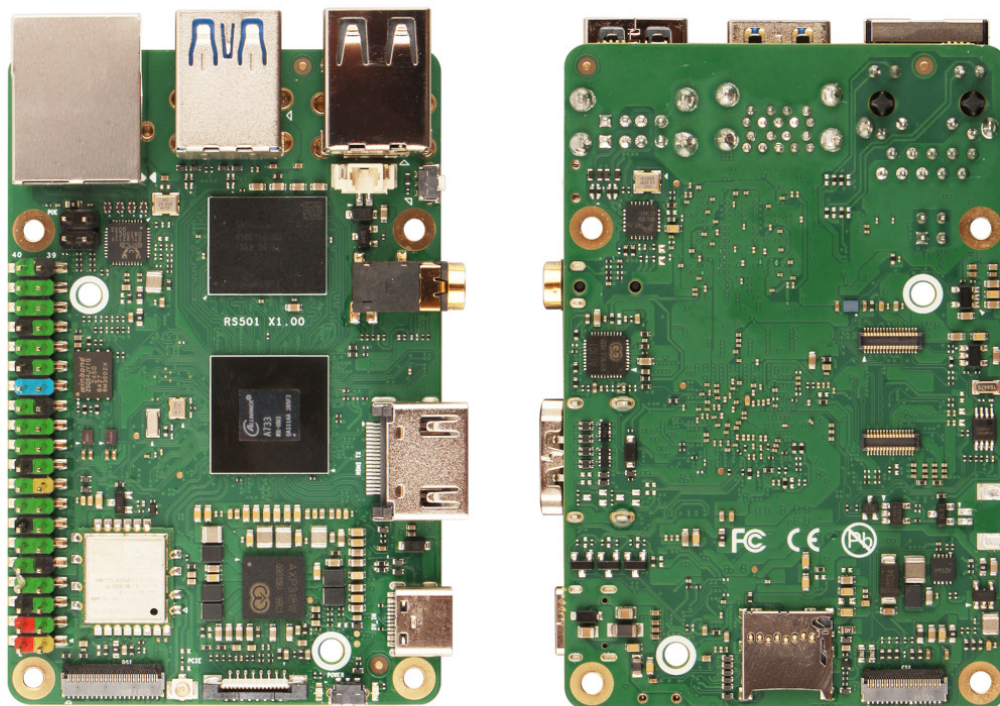
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## 1 Revision Control Table

| Version | Date       | Changes from previous version           |
|---------|------------|-----------------------------------------|
| 1.0     | 2025-08-13 | First version                           |
| 1.1     | 2025-08-29 | Correct 40 Pin GPIO Alternate Functions |

## 2 Introduction

The Radxa Cubie A7A is an ultra-compact and feature-rich Single Board Computer (SBC) designed to deliver powerful performance in space-constrained environments. With its Allwinner A733 SoC featuring a hybrid octa-core CPU (2× Cortex-A76 up to 2.0GHz + 6× Cortex-A55), 3 TOPS NPU, and Imagination BXM-4-64 MC1 GPU, the Cubie A7A provides robust AI and multimedia processing capabilities. It's an ideal choice for developers, system integrators, and innovators in fields such as edge AI, digital signage, robotics, smart displays, and industrial automation.



**Note** The board layout or component locations may change over time, but the main connector types and locations will remain the same. Always refer to the latest documentation before manufacturing accessories or enclosures.

### 2.1 Features

#### 2.1.1 Hardware

- **Allwinner A733 SoC**

- **Octa-core CPU:** Dual-core Cortex-A76 up to 2.0GHz + Hexa-core Cortex-A55 up to 1.8GHz
- **NPU:** 3 TOPS AI accelerator for real-time edge inference
- **Imagination BXM-4-64 MC1 GPU** supporting:
  - OpenGL® ES 3.2
  - Vulkan® 1.3
  - OpenCL™ 3.0
- **LPDDR5 RAM** options:
  - 2GB
  - 4GB
  - 6GB
  - 8GB
  - 12GB
  - 16GB
- Onboard SPI Flash for bootloader
- Onboard eMMC/UFS module connector for high-performance embedded storage
- H.265MP/VP9/AVS2 multivideo decoder up to 8K@24fps
- H.264BL/MP/HP multivideo decoder up to 4K@30fps
- H.264BP/MP/HP multivideo encoder up to 4K@30fps
- MJPEG encoder up to 4K@15fps, JPEG encoder up to 8K × 8K resolution
- Supports AES/DES/3DES/SM4 encryption and decryption algorithms

### 2.1.2 Interfaces

- **1× IEEE 802.11 a/b/g/n/ac/ax (Wi-Fi 6)** and **Bluetooth® 5.4** with BLE
- **1× External Antenna Connector**
- **1× PCIe 3.0 FPC Connector** (single-lane)
- **1× USB 3.1 HOST** Type-A Port
- **3× USB 2.0 HOST** Type-A Port
- **1× USB 2.0 OTG** Type-C® Port for Data and Power
- **1× MicroSD Card** slot
- **1× eMMC Module and UFS Module** combo connector
- **1× Gigabit Ethernet Port**, supporting PoE (additional PoE HAT required)
- **1× HDMI® Output** Interface, supporting up to 4Kp60 resolution
- **1× Camera Interface** (1× four-lane MIPI CSI or 2× two-lane MIPI CSI)
- **1× MIPI DSI** Interface (four-lane MIPI DSI)
- **1× 3.5mm Audio Jack with Microphone**
- **1× USB BOOT Button**
- **1× Power Button**

- **1x 2Pin PWM Fan header**
- **1x 2Pin RTC Battery header**
- **40-pin 0.1" (2.54mm) header** supporting:
  - UART, I2C, SPI, GPIO, PWM
  - 2 × 5V DC power in/out
  - 2 × 3.3V power out

These interfaces provide excellent expansion possibilities for creating intelligent systems that require high connectivity, multimedia output, and hardware flexibility.

## 2.2 Software

- **Debian Linux®** support
- **Android™ 13** support

*Note:* Android 13 support requires the official BSP or vendor-provided SDK. Actual feature set may depend on further validation and licensing.

- Hardware access/control library for Linux/Android

Combined with support for both Android 13 and Debian Linux, the Cubie A7A enables a flexible software environment for prototyping and deployment across diverse use cases.

## 3 Applications

- AI-enabled IoT edge nodes
- Smart retail displays and signage
- Compact industrial control systems
- AI vision and robotics modules
- Portable developer kits and maker projects

Technical drawing of a PCB layout showing two views: a top view and a bottom view. The top view shows a complex layout with various components, including a large central chip, numerous smaller components, and a dense array of components along the top edge. The bottom view shows a similar layout with components on the reverse side. Dimensions are provided in millimeters (mm) for both views.

**Top View Dimensions:**

- Overall width: 85.0 mm
- Overall height: 56.0 mm
- Top edge segments: 32.6 mm, 47.3 mm, 3.3 mm
- Left edge segments: 3.5 mm, 49.0 mm
- Bottom edge segments: 11.2 mm, 53.0 mm, 2.6 mm
- Internal horizontal segments: 58.0 mm, 31.0 mm
- Internal vertical segments: 22.1 mm
- Note: 4x  $\phi 2.7$  (indicating 4 holes with diameter 2.7 mm)

**Bottom View Dimensions:**

- Overall width: 85.0 mm
- Overall height: 56.0 mm
- Top edge segments: 43.9 mm, 14.8 mm
- Left edge segments: 13.2 mm, 28.0 mm

## 5 Electrical Specification

### 5.1 Power Requirements

The Cubie A7A supports both a fixed-voltage power adapter and a smart power adapter. Typical scenarios:

- **5V Power** supplied via USB Type-C port
- **5V Power** supplied to the GPIO pin (Pins 2 & 4)
- **PoE** supported via the Gigabit Ethernet port

A minimum 15W power source is recommended without power-consuming USB or PCIe devices, and at least 20W if fully loading USB 2.0/3.1 and PCIe 3.0 peripherals.

### 5.2 GPIO Voltage

| GPIO     | Voltage Level | Tolerance |
|----------|---------------|-----------|
| All GPIO | 3.3V          | 3.63V     |

## 6 Peripherals

### 6.1 GPIO Interface

The Cubie A7A offers a 40-pin GPIO expansion header, similar to many popular SBCs, ensuring compatibility with a wide range of accessories.

### 6.1.1 GPIO Alternate Functions

| Pin# | FUNC1 | FUNC2     | FUNC3        | FUNC4       | FUNC5     | FUNC6     | FUNC7      | FUNC8          | FUNC9    |
|------|-------|-----------|--------------|-------------|-----------|-----------|------------|----------------|----------|
| 1    | +3.3V |           |              |             |           |           |            |                |          |
| 3    | PJ23  | PWM1-5    | UART3-RX     | UART2-CTS   | TWI7-SDA  | TWI3-SDA  | TWI11-SDA  | PJ-EINT23      |          |
| 5    | PJ22  | PWM1-4    | UART3-TX     | UART2-RTS   | TWI7-SCK  | TWI3-SCK  | TWI11-SCK  | PJ-EINT22      |          |
| 7    | PB0   | UART2-TX  | UART0-TX     | SPI2-CS0    |           |           | JTAG-MS    | PB-EINT0       |          |
| 9    | GND   |           |              |             |           |           |            |                |          |
| 11   | PB1   | UART2-RX  | UART0-RX     | SPI2-CLK    | JTAG-CK   | PB-EINT1  |            |                |          |
| 13   | PL6   | S-JTAG-DO | S-UART0-TX   | S-SPI0-MOSI | S-IR-RX   | S-PWM0-4  | PL-EINT6   |                |          |
| 15   | PL7   | S-JTAG-DI | S-UART0-RX   | S-SPI0-MISO | S-PWM0-5  | PL-EINT7  |            |                |          |
| 17   | +3.3V |           |              |             |           |           |            |                |          |
| 19   | PD12  | LVDS1-D1P | DSI1-D1P     | EINK-D12    | SPI1-MOSI | PWM1-2    | PD-EINT12  |                |          |
| 21   | PD13  | LVDS1-D1N | DSI1-D1N     | EINK-D13    | SPI1-MISO | PWM1-3    | PD-EINT13  |                |          |
| 23   | PD11  | LVDS1-D0N | DSI1-D0N     | EINK-D11    | SPI1-CLK  | PWM1-1    | PD-EINT11  |                |          |
| 25   | GND   |           |              |             |           |           |            |                |          |
| 27   | PD17  | LVDS1-CKN | DSI1-D2N     | EINK-LEH    | TWI2-SDA  | UART3-RX  | PD-EINT1   |                |          |
| 29   | PK5   | MCSIA-CKP | PCIE-CLKREQN | PWM1-8      | PWM1-9    | SPI3-CLK  | NCSI1-D14  | JTAG-MAS-CK    | PK-EINT5 |
| 31   | PK6   | MCSIA-D2N | TWI2-SCK     | UART4-TX    | UART2-RTS | SPI3-MOSI | NCSI1-D13  | JTAG-MAS-DO    | PK-EINT6 |
| 33   | PK7   | MCSIA-D2P | TWI2-SDA     | UART4-RX    | UART2-CTS | SPI3-MISO | NCSI1-D12  | JTAG-MAS-DI    | PK-EINT7 |
| 35   | PK2   | MCSIA-D1N | UART6-DTR    | I2S4-LRCK   | HDMI-SDA  | TWI5-SDA  | NCSI1-PCLK | SGPIO-SDATAIN  | PK-EINT2 |
| 37   | PK8   | MCSIA-D3N | MCSI0-MCLK   | UART4-RTS   | UART2-TX  | SPI3-CS1  | NCSI1-D11  | JTAG-MAS-NTRST | PK-EINT8 |
| 39   | GND   |           |              |             |           |           |            |                |          |

| Pin# | FUNC1 | FUNC2      | FUNC3      | FUNC4        | FUNC5       | FUNC6        | FUNC7       | FUNC8          | FUNC9     |
|------|-------|------------|------------|--------------|-------------|--------------|-------------|----------------|-----------|
| 2    | +5.0V |            |            |              |             |              |             |                |           |
| 4    | +5.0V |            |            |              |             |              |             |                |           |
| 6    | GND   |            |            |              |             |              |             |                |           |
| 8    | PB9   | UART0-TX   | I2S0-DIN2  | I2S0-DOUBT2  | PWM1-1      | WATCHDOG-SIG | TWI8-SCK    | TWI0-SCK       | PB-EINT9  |
| 10   | PB10  | UART0-RX   | I2S0-DIN3  | I2S0-DOUBT3  | PWM1-2      | PLL-LOCK-DBG | TWI8-SDA    | TWI0-SDA       | PB-EINT10 |
| 12   | PK0   | MCSIA-D0N  | UART6-DCD  | I2S4-BCLK    | HDMI-CEC    | TWI1-SDA     | NCSI1-HSYNC | SGPIO-SLOAD    | PK-EINT0  |
| 14   | GND   |            |            |              |             |              |             |                |           |
| 16   | PJ24  | PWM1-6     | UART4-TX   | TWI4-SCK     | SPI3-CLK    | PJ-EINT24    |             |                |           |
| 18   | PJ25  | PWM1-7     | UART4-RX   | TWI4-SDA     | SPI3-MOSI   | PJ-EINT25    |             |                |           |
| 20   | GND   |            |            |              |             |              |             |                |           |
| 22   | PL10  | S-UART0-TX | S-TWI2-SCK | S-UART1-TX   | S-PWM0-8    | PL-EINT10    |             |                |           |
| 24   | PD10  | LVDS1-D0P  | DSI1-D0P   | EINK-D10     | SPI1-CS0    | PWM1-0       | PD-EINT10   |                |           |
| 26   | PD14  | LVDS1-D2P  | DSI1-CKP   | EINK-D14     | SPI1-HOLD   | UART3-RTS    | PD-EINT14   |                |           |
| 28   | PD16  | LVDS1-CKP  | DSI1-D2P   | EINK-OEH     | TWI2-SCK    | UART3-TX     | PD-EINT16   |                |           |
| 30   | GND   |            |            |              |             |              |             |                |           |
| 32   | PD20  | TWI0-SCK   | EINK-CKV   | PCIE-CLKREQN | UART4-TX    | TWI3-SCK     | PWM0-2      |                |           |
| 34   | GND   |            |            |              |             |              |             |                |           |
| 36   | PK1   | MCSIA-D0P  | UART6-DSR  | I2S4-MCLK    | HDMI-SCL    | TWI1-SCK     | NCSI1-VSYNC | SGPIO-SCLK     | PK-EINT1  |
| 38   | PK3   | MCSIA-D1P  | UART6-RI   | I2S4-DIN0    | I2S4-DOUBT1 | TWI5-SCK     | NCSI1-MCLK  | SGPIO-SDATAOUT | PK-EINT3  |
| 40   | PK4   | MCSIA-CKN  | PCIE-WAKEN | I2S4-DOUBT0  | I2S4-DIN1   | SPI3-CS0     | NCSI1-D15   | JTAG-MAS-MS    | PK-EINT4  |

**Note:** Certain pin functions (SPI, I2C, UART, PWM, etc.) might be mutually exclusive depending on software Device Tree configurations. Users should verify the required pin multiplexer settings.

## 6.2 Network

Equipped with **one 10/100/1000 Mbps RJ45** connectors, the Cubie A7A offers reliable wired networking. The Gigabit port supports **Power over Ethernet**. To use PoE, an additional **PoE HAT** (compliant with IEEE 802.3af/at) is required.

## 6.3 USB

The Cubie A7A offers a full range of USB interfaces to meet both data and power requirements:

- **1× USB 3.1 Type-A Port** for high-speed device connection (HOST mode)
- **3× USB 2.0 Type-A Ports** for peripheral expansion (HOST mode)
- **1× USB 2.0 Type-C® Port** for OTG or device mode, also serves as the power input and firmware flashing interface

All USB ports feature overcurrent protection. The total available power output across the USB data ports is up to 2.8A, depending on system power input.

## 6.4 eMMC / UFS Module Connector

The Cubie A7A offers a high speed eMMC / UFS module connector for eMMC or UFS modules which can be used for OS and data storage. The eMMC / UFS module connector is compatible with readily available industrial pinout and form factor hardware.

The eMMC connector offer eMMC 5.1 high speed interface for small capacity storage(8GB to 128GB) and UFS connector offer UFS 3.0 2-lane up to gear 4 high speed interface for large capacity storage(64G to 1TB).

## 6.5 Camera and Display Interfaces

The Cubie A7A includes:

- **One four-lane MIPI CSI** camera connector (capable of splitting into 2× two-lane)
- **One four-lane MIPI DSI** display connector

These connectors are designed for Radxa camera and display accessories and are also compatible with many industrial cameras and displays using Radxa adapter FPC cables.

## 6.6 HDMI Output

An **HDMI Type-A** port (HDMI 2.0) is available, supporting resolutions up to 3840×2160 (4K@60fps) for 2D displays and 4K@30fps for 3D displays. This port also supports CEC and HDCP 1.4. Actual HDCP usage may require appropriate licensing and firmware support.

## 6.7 FPC Connector

The Cubie A7A offers a FPC connector providing PCIe 3.0 one-lane signal, supporting expansion of SSD, SATA, 2.5G Ethernet ports and other devices, This requires additional expansion board / HAT.

## 7 Order Info and SKU

| Name           | CPU                          | RAM LPDDR5 | SPI Flash | WiFi / BT               | SKU Code          |
|----------------|------------------------------|------------|-----------|-------------------------|-------------------|
| Cubie A7A 2GB  | A733MX-HN3 HDMI / 3 Tops NPU | 2GB        | 8MB       | FCU760K WiFi 6 / BT 5.4 | RS501-D2S8R42W28  |
| Cubie A7A 4GB  |                              | 4GB        |           |                         | RS501-D4S8R42W28  |
| Cubie A7A 6GB  |                              | 6GB        |           |                         | RS501-D6S8R42W28  |
| Cubie A7A 8GB  |                              | 8GB        |           |                         | RS501-D8S8R42W28  |
| Cubie A7A 12GB |                              | 12GB       |           |                         | RS501-D12S8R42W28 |
| Cubie A7A 16GB |                              | 16GB       |           |                         | RS501-D16S8R42W28 |

## 8 Availability

Radxa guarantees availability of the **Radxa Cubie A7A** until at least **September 2034**. However, certain component shortages or EOL announcements from third-party suppliers may affect lead times. Please check with Radxa for the latest updates.

## 9 Support

For support, please refer to:

- The hardware documentation section of the [Radxa Website](#)
- [Radxa forum](#) for community discussions and official Q&A

## 10 Trademark Acknowledgments

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