Radxa ROCK 5 ITX Product Brief

8K ARM Personal Computer

Revision 1.0

2024-04-24

Radxa Computer

Contents

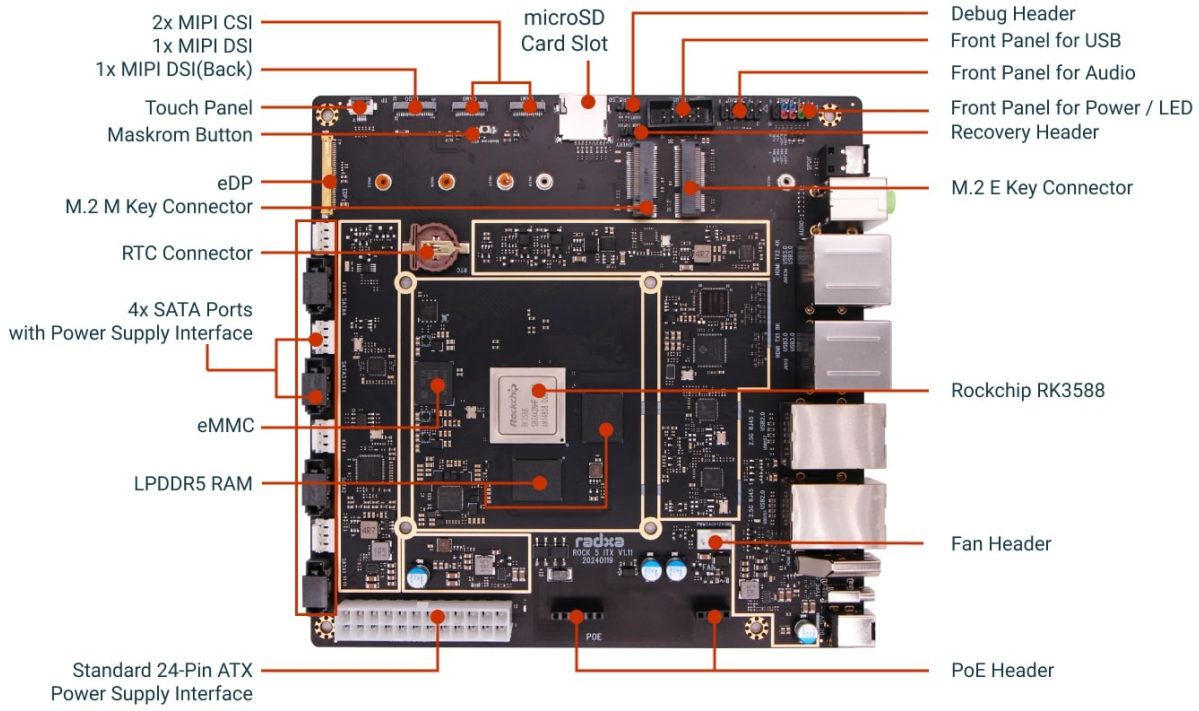
1 Revision Control Table

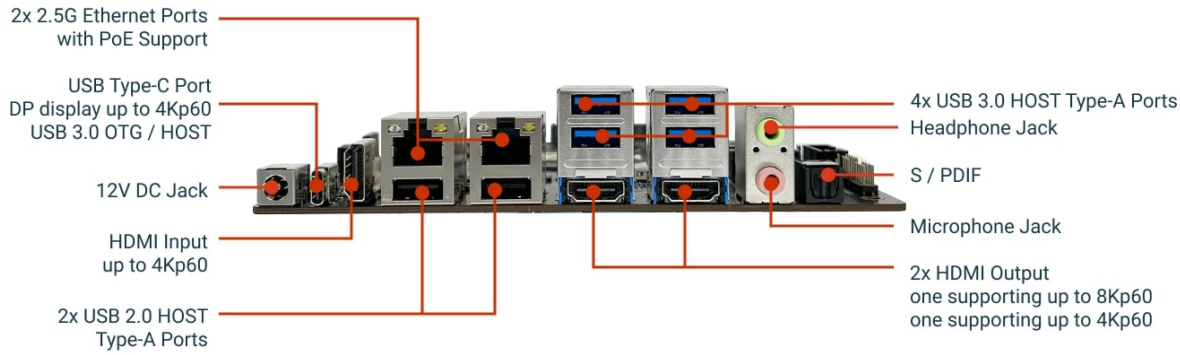
Version	Date	Changes from previous version
1.0	2024/04/24	First version

2 Introduction

The Radxa ROCK 5 ITX is a Single Board Computer equipped with the high-performance Rockchip RK3588 SoC, measuring 170 mm x 170 mm, and fully conforms to the standard Mini ITX specifications. Its size and form factor design allow it to be easily integrated into various ITX-compatible cases, offering a wide range of application scenarios. ROCK 5 ITX is particularly suitable for building personal multimedia centers, AI and machine learning platforms, as well as personal servers, meeting diverse needs.. Radxa offers the ROCK 5 ITX board in various LPDDR5 RAM memory options:

- 4GB
- 8GB
- 16GB
- 24GB
- 32GB





Note: The actual board layout or components' location may change during the time but the main connectors type and location will remain the same

3 Features

3.1 Hardware

- Rockchip RK3588 SoC
- Quad Cortex®-A76 @ 2.2/2.4GHz and a quad Cortex®-A55 @ 1.8GHz based on Arm® DynamIQ™ configuration
- Arm® Mali™ G610MC4 GPU supporting:
  - OpenGL® ES1.1, ES2.0, and ES3.2
  - OpenCL® 1.1, 1.2 and 2.2
  - Vulkan® 1.1 and 1.2
  - Embedded high performance 2D image acceleration module
- NPU supporting INT4 / INT8 / INT16 / FP16 / BF16 and TF32 acceleration and computing power is up to 6TOPs
- 64bit LPDDR5 RAM 5500MT/S with options:
  - 4GB
  - 8GB
  - 16GB
  - 24GB
  - 32GB
- Onboard eMMC for Roobi OS
- Able to provide 4 display outputs via two HDMI, one DP (type C) and one MIPI DSI
- H.265 / H.264 / VP9 / AV1 / AVS2 video decoder up to 8K@60fps
- H.264 / H.265 video decoder up to 8K@30fps

3.2 Interfaces

3.2.1 Back Panel Connectors

- 1x 12V DC in for power
- 1x USB Type-C™ port supporting:
  - DP display up to 4Kp60
  - USB 3.0 OTG / HOST
- 1x Standard HDMI input port, supporting up to 4Kp60 display input

- 2x 2.5 Gigabit Ethernet ports with one has PoE support(Additional PoE module Required)
- 2x Standard HDMI output ports, one supporting displays up to 8Kp60 resolution, one supporting up to 4Kp60
- 2x USB2 Type A HOST ports
- 4x USB3 5Gbps Type A HOST ports
- 1x Headphone Jack with Microphone Input
- 1x S/PDIF for digital audo output

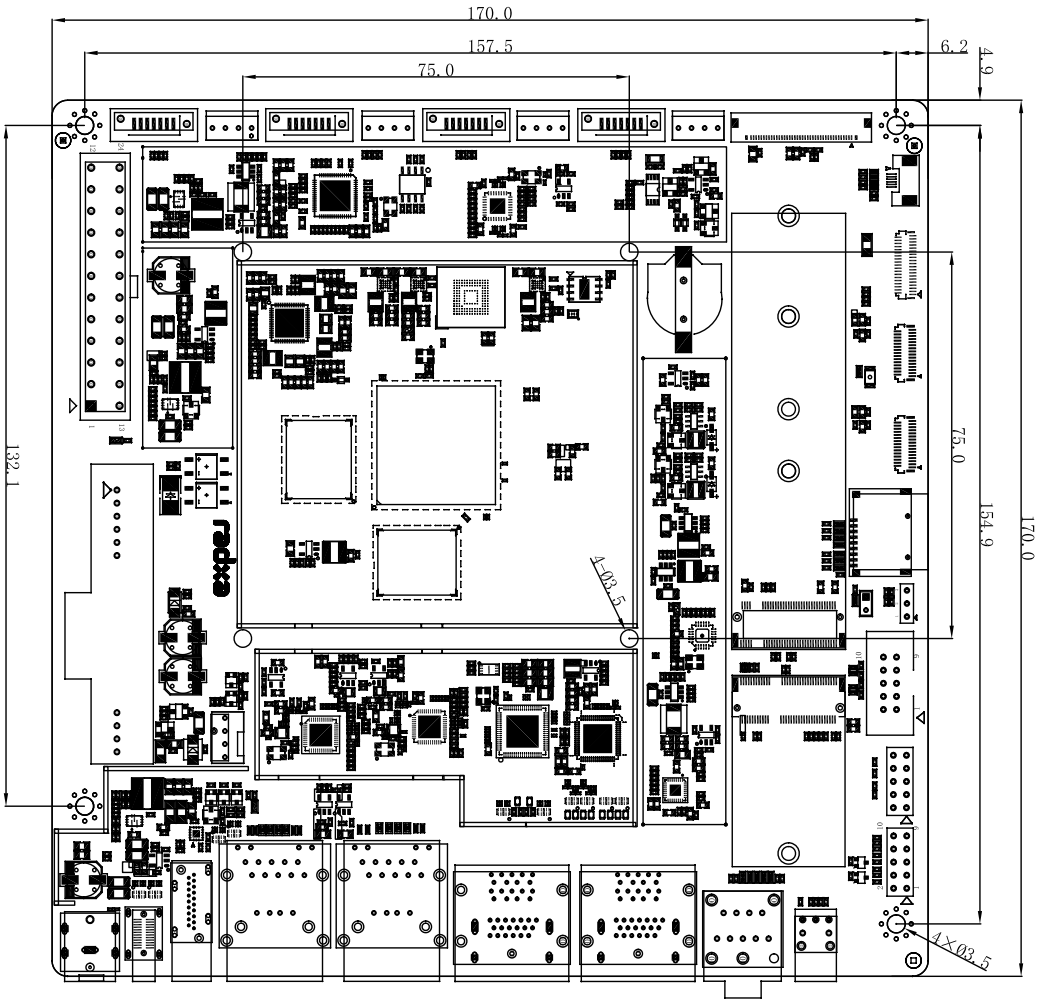
3.2.2 Internal Connectors

- 1x 24P ATX power connector
- 1x PoE module connector
- 1x Micro SD Card Slot
- 1x M.2 M Key Connectors for NVMe SSD with PCIe 3.0 2-lane support
- 1x M.2 E Key Connectors for WiFi / BT with PCIe 2.0 and USB
- 2x Camera port (2x four-lane MIPI CSI or 2x two-lane MIPI CSI)
- 2x MIPI LCD port (four-lane MIPI DSI)
- 1x eDP port with Touch panel interface for eDP LCD panel
- 4x SATA connector with power header
- 1x front panel connector for power / reset / status led
- 1x front USB 2.0 connector for two USB 2.0
- 1x audio connector for front audio jack
- Miscellaneous
  - 1x serial console for low level debug message
  - 1x RTC Battery Connector
  - 1x 4P Fan with PWM Control
  - 4x Heatsink Mounting Holes(75mm x 75mm)

3.3 Software

- ArmV8 Instruction Set
- Debian/Ubuntu Linux support
- Android 12 support
- OpenFyde OS(Chromium OS fork) support
- RKNPU2 NPU software stack

4 Mechanical Specification



5 Electrical Specification

5.1 Power Requirements

The ROCK 5 ITX supports various power supply technologies including standard ATX PSU, DC power adapter as well as PoE:

- Standard ATX PSU from the ATX power connector
- 12V DC Power adapter with 55x25 diameter, the inner is positive and the outline is ground
- Power from RJ45 port from PoE switch with PoE module

The recommended power source should be able to produce at least 90W(12V / 8A or larger) with 4x HDDs and at least 36W(12V / 3A or larger) without HDDs.

Please do not apply multiply power source at the same time, it may damage the board and the other end power source.

6 Operating Conditions

The ROCK 5 ITX has been designed to operate between 0°C to 50°C.

This temperature range was defined based on typical usage where the efficient use of Arm big.LITTLE technology can automatically select which processor core to utilise for a given task, the result of which is minimal heat generation and responsive user experience.

The ROCK 5 ITX is built on a high-performance mobile chipset which is designed to operate for extended durations on batteries with efficiency at its core. As with all electronic devices heat is a by-product of operation which increases with performance and workload; during basic use cases such as web browsing, editing text or listening to music the SoC will automatically select the smallest processors available or dedicated hardware accelerators to reduce heat generation thus reserving the higher performance processors and thermal window for demanding tasks as and when required.

The SoC (RK3588) is specified to limit its maximum internal temperature to 80°C before throttling the clock speeds to maintain reliability within the allowed temperature range. If the ROCK 5 ITX is intended to be used continuously in high performance applications, it may be necessary to use external cooling methods (for example, heat sink, fan, etc.) which will allow the SoC to continue running at maximum clock speed indefinitely below its predefined 80°C peak temperature limiter.

7 Peripherals

7.1 ATX Power Connector

A standard ATX 24Pin power connector is provied on ROCK 5 ITX.

7.2 PoE

The PoE Header is specific for the PoE power options. Radxa 25W PoE+ Module is required for the PoE function to work. With 25W PoE+ Module, the ROCK 5 ITX can only power to 1x 2.5inch HDD.

7.3 HDMI Input

The ROCK 5 ITX features a single standard HDMI input port, supporting HDMI 2.1 input with a max resolution of 4Kp60.

7.4 Ethernet

ROCK 5 ITX provides two 10/100/1000/2500 Mbps RJ45 connectors for wired networking. When equipped with an additional PoE module, the ROCK 5 ITX can be powered through an Ethernet cable connected to the either one of the RJ45 ports, leveraging the capabilities of a PoE-enabled switch or router.

7.5 USB

- USB Type-C
  - The ROCK 5 ITX is equipped with a USB 3.0 OTG Type-C port and supports a DP interface, which allows for a maximum resolution of 4Kp60. Power input from the USB C is not supported.
- Back Panel USB:
  - The Back Panel offers 2x USB 2.0 HOST ports(shared connector with RJ5), combined output power for these four ports is 1A
  - The Back Panel offers 2x double USB 3.0 HOST ports(shared connector with HDMI), combined output power for each double USB 3.0 ports is 1.75A.

- Front Panel USB:
  - F_USB connector offers 2x USB 2.0 HOST ports, the combined output power for these two ports is 1A.

7.6 HDMI Output

The ROCK 5 ITX is equipped with two standard HDMI output ports, both featuring CEC support and HDMI 2.1 compatibility. These ports offer impressive resolutions, delivering 8Kp60 and 4Kp60, respectively.

7.7 Audio

- 3.5mm Audio Jack
  - The ROCK 5 ITX supports high quality analogue audio output via a 3-ring 3.5mm headphone jack. The analog audio output can drive 32 Ohm headphones directly. The audio jack also supports microphone input as default.
- S/PDIF Digital Audio
  - The ROCK 5 ITX supports high quality digital audio output via a S/PDIF connector
- Front Panel Audio Connector
  - A front panel audio connector is available for 3.5mm audio jack on the PC enclosure.

7.8 M.2 Connector

The ROCK 5 ITX offers two M.2 connectors:

- A M.2 E Key with 2230 mouting hole providing 1-lane PCIe 2.1 and USB singal, supporting industrial standard M.2 WiFi 6 modules.
- A M.2 M Key socket with 2-lane PCIe 3.0 interface. A standard M.2 2280 mouting hole is on the board to enable the deployment of a M.2 2280 NVMe SSD. Please note that M.2 SATA SSDs are not supported.

7.9 Camera Interfaces

The ROCK 5 ITX is equipped with two four-channel MIPI CSI camera connectors. These connectors are specifically designed for Radxa Cameras. Moreover, they offer backward compatibility, allowing the use of other standard industrial camera peripherals through Radxa’s adapter FPC cables.

7.10 MIPI LCD Interfaces

The ROCK 5 ITX is equipped with two four-channel MIPI DSI LCD connectors. These connectors are specifically designed for Radxa Displays. Moreover, they offer backward compatibility, allowing the use of other standard industrial display peripherals through Radxa’s adapter FPC cables.

7.11 eDP and Touch Panel

The ROCK 5 ITX offers a 40P eDP connector for eDP panels. A 6P touch panel connector is provided for the i2c based touch screens.

7.12 SATA

The ROCK 5 ITX offers a 7P SATA connector with a 4P SATA power connector providing 12V and 5V power for SATA SSDs and HDDs.

7.13 RTC

ROCK 5 ITX provide RTC function on board, a RTC battery holder is on the motherboard. The RTC battery model supported is CR1220, it’s for off power time keeping.

7.14 Heatsink / Cooler

The ROCK 5 ITX offers 4x mount holes for the cooler with mounting hole distand 75mm, making it compatible with Intel LGA 151x type cooler. An ATX standard fan connector is provided for cooler with fan. The fan tach is not supported on ROCK 5 ITX.

8 Availability

Radxa guarantees availability of the Radxa ROCK 5 ITX until at least September 2032.

9 Support

For support please see the hardware documentation section of the Radxa Website and post questions to the Radxa forum.