radxa

Radxa ROCK 4A+ Product Brief
High Performance 4K Single Board Computer

Revision 1.0
### 2023-09-14

Radxa Computer

Contents

1 Revision Control Table

Version	Date	Changes from previous version
1.0	14/09/2023	First version

2 Introduction

The Radxa ROCK 4A+ is a Single Board Computer (SBC) in a credit card sized form factor packed with a wide range of class-leading functionality, features and expansion options. The Radxa ROCK 4A+ is an ideal choice for anyone from hobbyists to professionals who need an extremely highly specified platform with outstanding reliability. Radxa offers this board in various memory and storage options.
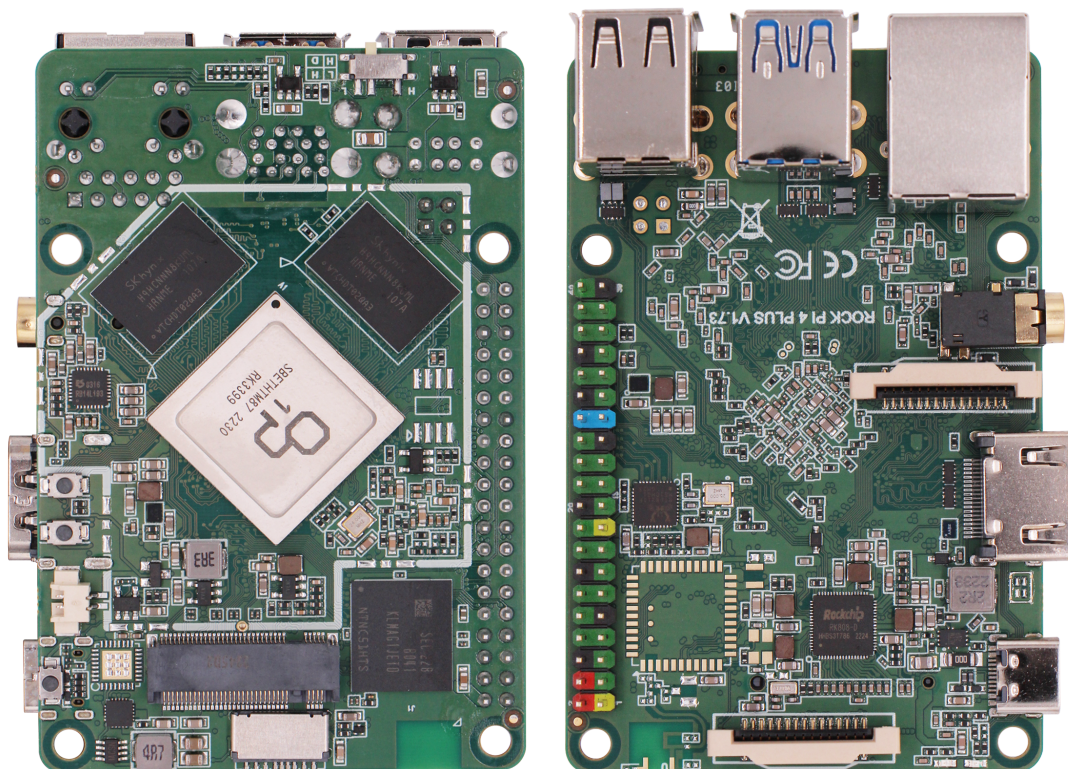
Note: The actual board layout or silkscreen may change during the time but the main connectors type and location will remain the same

3 Features

3.1 Hardware

- Rockchip OP1 SoC

- Arm® big.LITTLE™ technology (Dual Cortex® A72 frequency 2.0GHz and a Quad Cortex A53 frequency 1.6GHz)

- Arm Mali™ T860MP4 GPU, supporting

  - OpenGL® ES 1.1 /2.0 /3.0 /3.1 /3.2
  - Vulkan® 1.0
  - Open CL® 1.1 1.2
  - DirectX® 11.1

- Dual Arm Cortex – M0
- Dual channel 2GB / 4GB 64bit LPDDR4
- High performance on board eMMC with 8GB, 16GB, 32GB, 64GB, 128GB options
- Display supporting mirror and extended modes

  - HDMI
  - MIPI DSI

- H.265/VP9 (HEVC) hardware decode (up to 4Kp60)
- H.264 hardware decode (up to 1080p60)
- USB Type-C™ PD/QC power input

3.2 Interfaces

- 1x TF Card Slot

- 1x HDMI ports supporting displays up to 4Kp60 resolution
- 2x USB2 HOST ports
- 1x USB3 OTG/HOST port, 1x USB3 HOST port
- 1x Gigabit Ethernet port without PoE support
- 1x camera port (2-lane MIPI CSI)
- 1x display port (4-lane MIPI DSI)
- 1x maskrom button
- 1x reset button

- 1x recovery button
- 40x user GPIO supporting a wide range of interface options:

  - 2 x UART
  - 2 x SPI bus
  - 2 x I2C bus
  - 1 x PCM/I2S
  - 1 x SPDIF
  - 1 x PWM
  - 1 x ADC
  - 6 x GPIO
  - 2 x 5V DC power in
  - 2 x 3.3V power pin

3.3 Software

- Full implementation of the Arm architecture v8-A instructions set, Arm NEON Advanced SIMD (single instructions, multiple data) support for accelerating media and signal processing
- Armv8 cryptography extensions
- TrustZone® technology support
- Debian/Ubuntu Linux support
- Android 7.1/Android 9.0/Android 10/Android 11 support
- GPU enabled Al stack, (eg. Caffe)
- Hardware access/control library for Linux/Android

Software images can be downloaded from: https://wiki.radxa.com/Rock4/downloads

4 Mechanical Specification
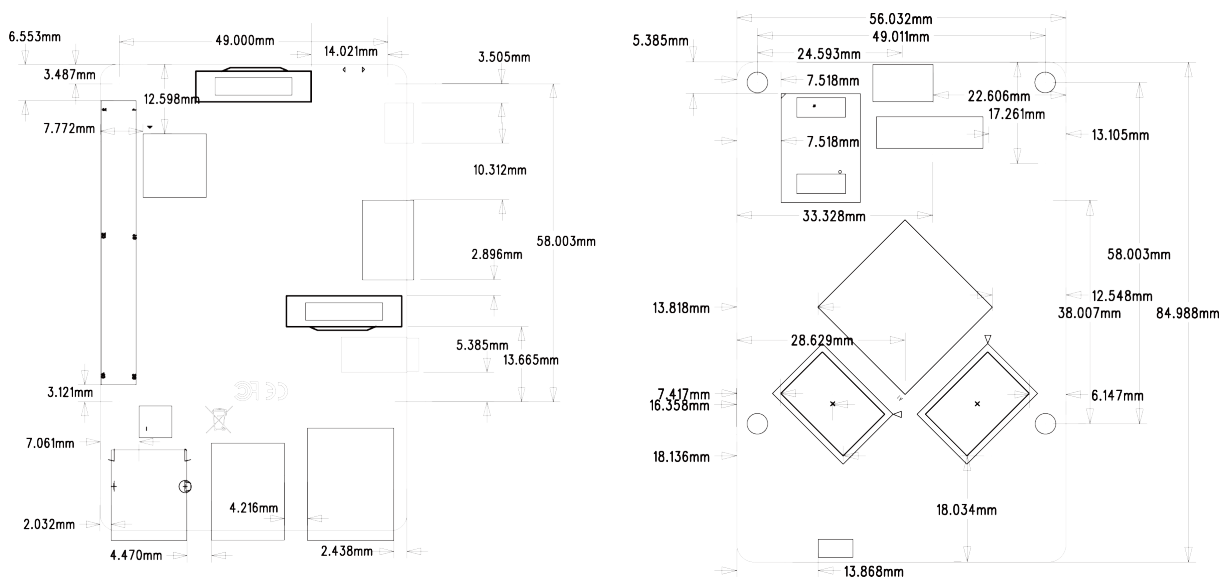
5 Electrical Specification

5.1 Power Requirements

The ROCK 4A+ supports various power supply technologies including smart power adapter as well as fixed voltage:

- USB Type-C™ PD 2.0, 9V/2A, 12V/2A

- Qualcomm® Quick Charge™ 2.0 QC3.0/2.0 adapter, 9V/2A, 12V/1.5A

- Power adapter with fixed voltage in 6V to 12V range on the USB C power port

- 5V Power applied to the GPIO PIN 2 & 4

5.2 GPIO Voltage

GPIO	Voltage Level	Tolerance
GPIO3_C0	3.3V	3.465V
ADC_IN0	1.8V	1.98V
Other GPIO	3.0V	3.14V

6 Operating Conditions

The Radxa ROCK 4A+ 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 Radxa ROCK 4A+ is built on a high-performance mobile chipset which is designed to oper- ate 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 (Rockchip OP1) 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 Radxa ROCK 4A+ 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 prede- fined 80°C peak temperature limiter.

7 Peripherals

7.1 GPIO Interface

The Radxa ROCK 4A+ offers a 40P GPIO expansion header which provides extensive compatibility with a wide range of accessories developed for the SBC market.

7.1.1 GPIO Alternate Functions

GPIO number	Function2	Function1	GPIO	Pin#	Pin#	GPIO	Function1	Function2	GPIO number
		+3.3V		1	2		+5.0V		
71		I2C7_SDA	GPIO2_A7	3	4		+5.0V		
72		I2C7_SCL	GPIO2_B0	5	6		GND		
75		SPI2_CLK	GPIO2_B3	7	8	GPIO4_C4	UART2_TXD		148
		GND		9	10	GPIO4_C3	UART2_RXD		147
146		PWM0	GPIO4_C2	11	12	GPIO4_A3	I2S1_SCLK		131
150		PWM1	GPIO4_C6	13	14		GND		
149		SPDIF_TX	GPIO4_C5	15	16	GPIO4_D2			154
		+3.3V		17	18	GPIO4_D4			156
40	UART4_TXD	SPI1_TXD	GPIO1_B0	19	20		GND		
39	UART4_RXD	SPI1_RXD	GPIO1_A7	21	22	GPIO4_D5			157
41		SPI1_CLK	GPIO1_B1	23	24	GPIO1_B2	SPI1_CSn		42
		GND		25	26		ADC_IN0		
64		I2C2_SDA	GPIO2_A0	27	28	GPIO2_A1	I2C2_CLK		65
74	I2C6_SCL	SPI2_TXD	GPIO2_B2	29	30		GND		
73	I2C6_SDA	SPI2_RXD	GPIO2_B1	31	32	GPIO3_C0	SPDIF_TX	UART3_CTSn	112
76		SPI2_CSn	GPIO2_B4	33	34		GND		
133		I2S1_LRCK_TX	GPIO4_A5	35	36	GPIO4_A4	I2S1_LRCK_RX		132
158			GPIO4_D6	37	38	GPIO4_A6	I2S1_SDI		134
		GND		39	40	GPIO4_A7	I2S1_SDO		135

Please note that pin 3, 5, 27, 28, 29 and 31 have a 4K7 pull up resistor to 3V.

7.2 Camera and Display Interfaces

The ROCK 4A+ has 1x 2-lane MIPI CSI Camera and 1x 2-lane MIPI DSI Display connector. These connectors are backwards compatible with standard industrial camera and display peripherals.

7.3 USB

The ROCK 4A+ is equipped with 4 USB ports.

There are two native speed USB 2 HOST ports powered from a shared regulator which also provides power to the lower USB 3 port. The cumulative power output across these three ports is 1.44A.

The board also has two USB 3 HOST ports which are driven directly from the OP1 SoC which means they can also run at full native speed(5Gbps). The upper USB 3 port can be configured to OTG mode by moving the slide switch located on the underside of the board below the USB ports. Power to the upper USB 3 port is driven directly by a regulator which can provide up to 1.44A current.

7.4 HDMI

The ROCK 4A+ has 1x full-sized HDMI port, which supports CEC (Consumer Electronics Control, a feature of HDMI designed to control HDMI connected devices by using only one remote controller) and HDMI 2.0 with UHD resolution up to 4Kp60 (~ 3840 x 2160 px)

7.5 Audio Jack

The ROCK 4A+ supports high quality analogue audio output via a 4-ring 3.5mm headphone jack. The analog audio output can drive 32 Ohm headphones directly. The audio jack also supports microphone input as default.

7.6 M.2 Connector

The ROCK 4A+ offers a M.2 M Key connector with 4-lan PCIe 2.1 interface, providing high speed M.2 NVMe SSD expansions, M.2 SATA SSD is not supported.

8 Order Info

ROCK 4A+ offers the following models and configurations:

SoC	PoE	SPI Flash	WiFi/BT	Antenna	RAM	EMMC	Model
OP1	Unsupported	N/A	N/A	N/A	2GB	16GB	RS114AP-**D2E16**
					4GB	16GB	RS114AP-**D4E16**
						32GB	RS114AP-**D4E32**
						64GB	RS114AP-**D4E64**
						128GB	RS114AP-**D4E128**

9 Availability

Radxa guarantees availability of the ROCK 4A+ until at least September 2029.

10 Support

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