
Radxa ROCK 5 Model A

8K Credit Card-Sized Single Board Computer

Revision 1.1

2023-01-11



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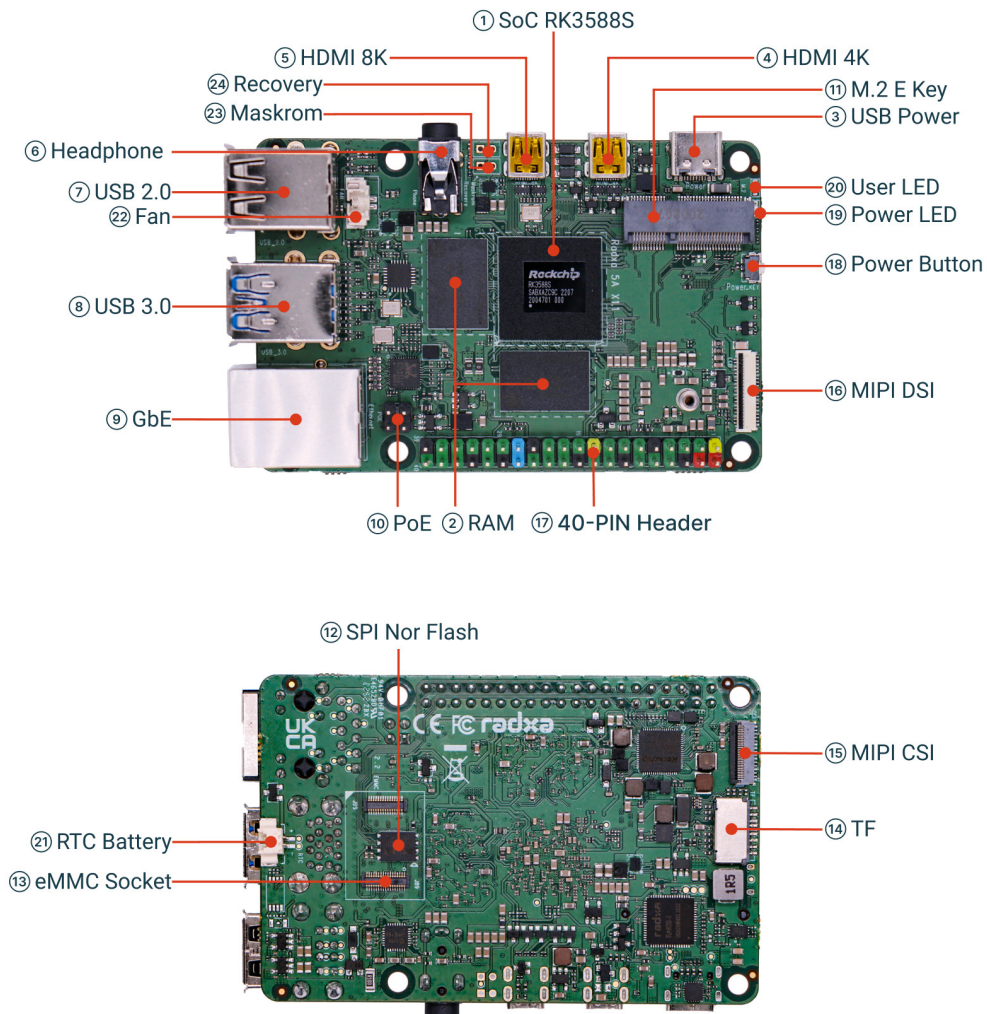
1 Revision Control Table

Version	Date	Changes from previous version
1.0	11/01/2023	First version
1.1	12/01/2023	Improve readability

2 Introduction

The Radxa ROCK 5 Model A (ROCK 5A) is a Single Board Computer (SBC) in a compact form factor packed with a wide range of class-leading functionality, features and expansion options. The ROCK 5A is an ideal choice for makers, IoT enthusiasts, hobbyists, gamers, PC users and everyone who need an extremely highly specified platform with outstanding performance and reliability. Radxa offers the ROCK 5A board in various LPDDR4x RAM memory options:

- 4GB
- 8GB
- 16GB



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 RK3588S 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
- 64bits LPDDR4x RAM options:
 - 4GB
 - 8GB
 - 16GB
- Able to provide 3 display outputs via two HDMI, and one MIPI DSI
- H.265/H.264/AV1/AVS2 multivideo decoder up to 8K@60fps
- H.264/H.265 multivideo decoder up to 8K@30fps

3.2 Interfaces

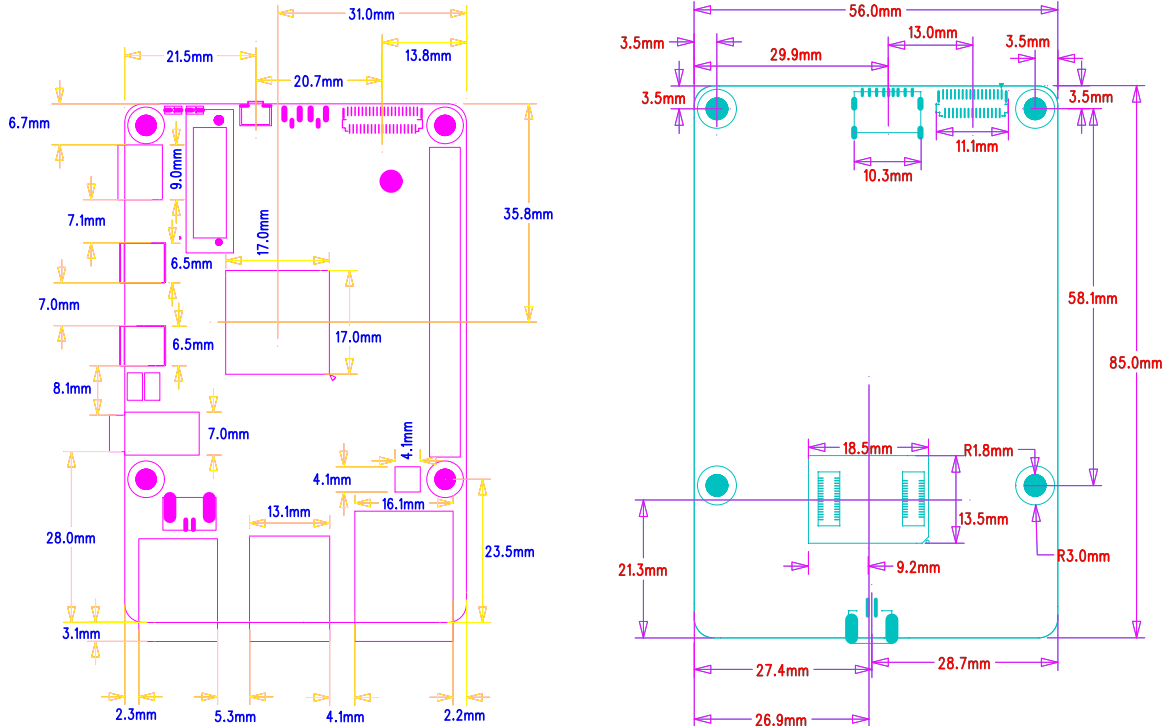
- 1x USB Type-C™ port for power supporting USB PD 2.0 and QC 2.0
- 1x Micro SD Card
- 2x micro HDMI output ports, one supporting displays up to 8Kp60 resolution, one supporting up to 4Kp60
- 2x USB2 Type A HOST ports
- 1x USB3 Type A HOST port, 1x USB3 Type A OTG/HOST port
- 1x Gigabit Ethernet port (supports PoE with add-on PoE HAT)
- 1x M.2 E Key with PCIe 2.1 one-lane, SATA, USB 2.0 support
- 1x eMMC module connector for eMMC 5.1 support
- 1x Camera port (1x four-lane MIPI CSI or 2x two-lane MIPI CSI)
- 1x LCD Display port (four-lane MIPI DSI)
- Miscellaneous
 - 1x RTC battery connector
 - 1x PWM fan connector
 - 1x Power button
 - 1x Recovery pin, 1x Maskrom pin

- 1x Power LED, 1x User LED
- 40 pin 0.1” (2.54mm) header supporting a wide range of interface options:
 - Up to 5 x UART(2x with flow control)
 - Up to 3 x SPI bus
 - Up to 6 x I2C bus
 - Up to 1 x PCM/I2S
 - Up to 2 x SPDIF
 - Up to 7 x PWM
 - Up to 1 x CAN
 - Up to 1 x ADC
 - Up to 27 x GPIO
 - 2 x 5V DC power in/out
 - 2 x 3.3V power out

3.3 Software

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

4 Mechanical Specification



5 Electrical Specification

5.1 Power Requirements

The ROCK 5A supports various power supply technologies including smart power adapter as well as fixed voltage:

- USB Type-C™ PD Version 2.0 with 9V/2A, 12V/2A, 15V/2A and 20V/2A.
- Qualcomm® Quick Charge™ 2.0 QC 3.0/2.0 adapter, 9V/2A, 12V/2A
- Power adapter with fixed voltage in 5.2V to 20V range on the USB Type-C port
- 5V Power applied to the GPIO PIN 2 & 4

The recommended power source should be able to produce, at least, 24W without a M.2 SSD or 30W with a M.2 SSD.

5.2 GPIO Voltage

GPIO	Voltage Level	Tolerance
All GPIO	3.3V	3.63V
SARADC_IN5	3.3V	3.3V

6 Operating Conditions

The ROCK 5A 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 5A 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 (RK3588S) 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 5A 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 GPIO Interface

The ROCK 5A offers a 40 pin GPIO expansion header which provides extensive compatibility with a wide range of accessories developed for the SBC market.

7.1.1 GPIO Alternate Functions

Function6	Function5	Function4	Function3	Function2	Function1	Pin#	Pin#	Function1	Function2	Function3	Function4	Function5	Function6	Function7
						+3.3V	1	2	+5.0V					
		UART6_RX	SPI4_MISO	I2C2_SDA	GPIO1_A0	3	4	+5.0V						
		UART6_TX	SPI4_MOSI	I2C2_SCL	GPIO1_A1	5	6	GND						
		PDM1_CLK1	UART4_TX	SPI0_CLK	GPIO1_B3	7	8	GPIO0_B5	UART2_TX	I2C1_SCL	I2S1_MCLK			
						GND	9	10	GPIO0_B6	UART2_RX	I2C1_SDA	I2S1_SCLK		
PWM0		UART6_RTSS	SPI4_CLK	I2C4_SDA	GPIO1_A2	11	12	GPIO4_A1	SPI0_MOSI	UART9_CTS	I2S1_SCLK			
PWM1		UART6_CTSS	SPI4_CS0	I2C4_SCL	GPIO1_A3	13	14	GND						
I2S1_SDO3	SPDIF0_TX	PWM11		UART9_TX	GPIO4_B4	15	16	GPIO1_D6	I2C8_SCL	UART1_RTS	PWM14			
						+3.3V	17	18	GPIO1_D7	I2C8_SDA	UART1_CTS	PWM15		
				SPI2_MOSI	GPIO1_A5	19	20	GND						
				SPI2_MISO	GPIO1_A4	21	22	GPIO1_B5	SPI0_CS1	UART7_TX				
				SPI2_CLK	GPIO1_A6	23	24	GPIO1_A7	SPI2_CS0	PDM1_SDIO	PWM3			
						GND	25	26	SARADC_VIN5					
CAN1_TX	I2S1_SDO2	PWM15		UART8_CTS	I2C7_SDA	GPIO4_B3	27	28	GPIO4_B2	I2C7_SCL	SPI0_CS0	UART8_RTS	PWM14	I2S1_SDO1
				PDM1_SDI3	UART4_RX	SPI0_MOSI	GPIO1_B2	29	30	GND				
				PDM1_SDI2	SPI0_MISO	GPIO1_B1	31	32	GPIO4_B0	I2C6_SDA	UART8_TX	I2S1_SDI3		
				PDM1_CLK0	UART7_RX	GPIO1_B4	33	34	GND					
				I2S1_MCLK	UART9_RTS	SPI0_MISO	GPIO4_A0	35	36	GPIO4_A2	SPI0_CLK	I2S1_LRCK		
				PDM1_SDI1	SPI2_CS1	GPIO1_B0	37	38	GPIO4_A5	I2C3_SDA	UART3_TX	I2S1_SDIO		
						GND	39	40	GPIO4_B1	I2C6_SCL	SPI0_CS1	UART8_RX	SPDIF1_TX	I2S1_SDO0

7.2 Network

ROCK 5A offers a 10/100/1000Mbit RJ45 connector for wired networking. With additional PoE module/HAT, ROCK 5A can be powered by ethernet cable via RJ45 port by a PoE capable switch/router.

7.3 eMMC Socket

ROCK 5A offers a high speed eMMC socket for eMMC modules which can be used for OS and data storage. The eMMC socket is compatible with readily available industrial pinout and form factor hardware.

It is worth noting that the eMMC module shall be larger than 8GB and there is not maximum size limitation.

7.4 Camera and Display Interfaces

The ROCK 5A has one four-lane (can be split into 2x two-lane) MIPI CSI Camera and one four-lane MIPI DSI Display connector. These connectors are designed for Radxa Camera and

Display accessories and also backwards compatible with standard industrial camera and display peripherals with adapter FPC cables by Radxa.

7.5 USB

The ROCK 5A has two USB2 HOST, one USB3 HOST and one USB3 OTG/HOST type-A connectors. The power output across these ports is 2.8A in aggregate over the four connectors.

7.6 HDMI Output

The ROCK 5A has two micro HDMI output ports (Type D), both support CEC and HDMI 2.1 with resolutions of 8Kp60 and 4Kp60 respectively.

7.7 Audio Jack

The ROCK 5A 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.

7.8 M.2 Connector

The ROCK 5A offers a M.2 E Key with 2230 mounting hole providing PCIe 2.1 one-lane or SATA and USB signal, supporting industrial standard M.2 WiFi 6 modules.

7.9 Fan Connector

The ROCK 5A has a 2pin 1.25mm header that enables users to connect a 5V fan (or other peripheral). The fan can be PWM controlled without speed feedback.

8 Availability

Radxa guarantees availability of the ROCK 5A until at least September 2033.

9 Support

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

