Product Brief

Radxa ROCK 3B Product Brief

An Pico-ITX form factor SBC with Multifunctional Interface

Revision 1.3

2023-11-06

Radxa Computer

Contents

1 Revision Control Table 2

2 Introduction 3

3 Features 4
- 3.1 Hardware . . . 4
- 3.2 Interfaces . . . 4
- 3.3 Software . . . 5

4 Mechanical Specification 5

5 Electrical Specification 6
- 5.1 Power Requirements . . . 6
- 5.2 GPIO Voltage . . . 6

6 Peripherals 6
- 6.1 GPIO Interface . . . 6
  - 6.1.1 GPIO Alternate Functions . . . 6
- 6.2 eMMC Socket . . . 7
- 6.3 Camera Interface . . . 7
- 6.4 Display Interfaces . . . 7
- 6.5 HDMI . . . 8
- 6.6 USB . . . 8
- 6.7 Audio Jack . . . 8
- 6.8 M.2 M Key Connector . . . 8
- 6.9 M.2 E Key Connector . . . 8
- 6.10 M.2 B Key Connector . . . 9

7 Temperature Range and Thermals 9

8 Model and SKU 9

9 Availability 10

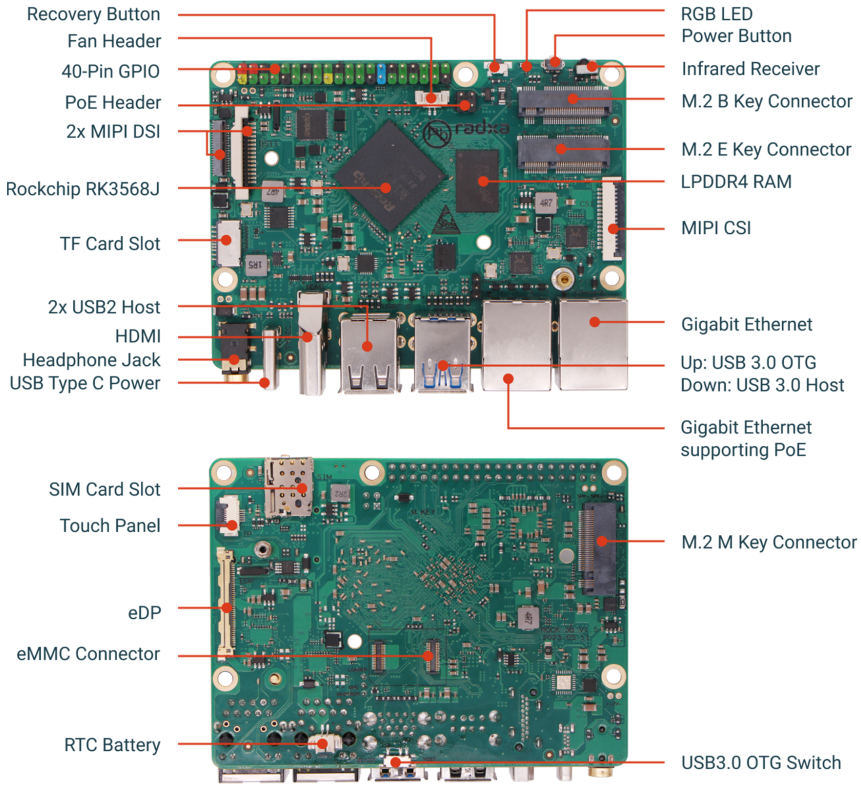
10 Support 10

1 Revision Control Table

Version	Date	Changes from previous version
1.0	04/03/2022	First version
1.1	05/07/2023	Update Images
1.2	04/09/2023	Update Information
1.3	06/11/2023	Update Information

2 Introduction

The Radxa ROCK 3B, a single-board computer (SBC) based on the Pico-ITX form factor (100mm x 75mm), not only excels in terms of performance compared to similar products but also garners acclaim for its outstanding mechanical compatibility. The ROCK 3B series encompasses not only a community version but also an industrial version tailored specifically for industrial applications. The industrial version of ROCK 3B, with its rich interface options and specialized support for a wide temperature range, provides manufacturers and customers in the industrial sector with a reliable and powerful platform. Here, creative sparks can ignite, concepts can transform into innovations, and a multitude of ideas can materialize, offering exhilarating possibilities.



3 Features

3.1 Hardware

- Rockchip RK3568J with Quad core Cortex-A55 (ARM v8) 64-bit SoC @ 2.0GHz
- Mali G52 GPU, supports OpenGL ES 1.1/2.0/3.2, OpenCL 2.0 and Vulkan 1.1
- 2GB / 4GB / 8GB LPDDR4
- Triple display via HDMI, 2x MIPI DSI or eDP
- H.265/VP9 (HEVC) hardware decode (up to 4Kp60)
- H.264 hardware decode (up to 1080p60)

3.2 Interfaces

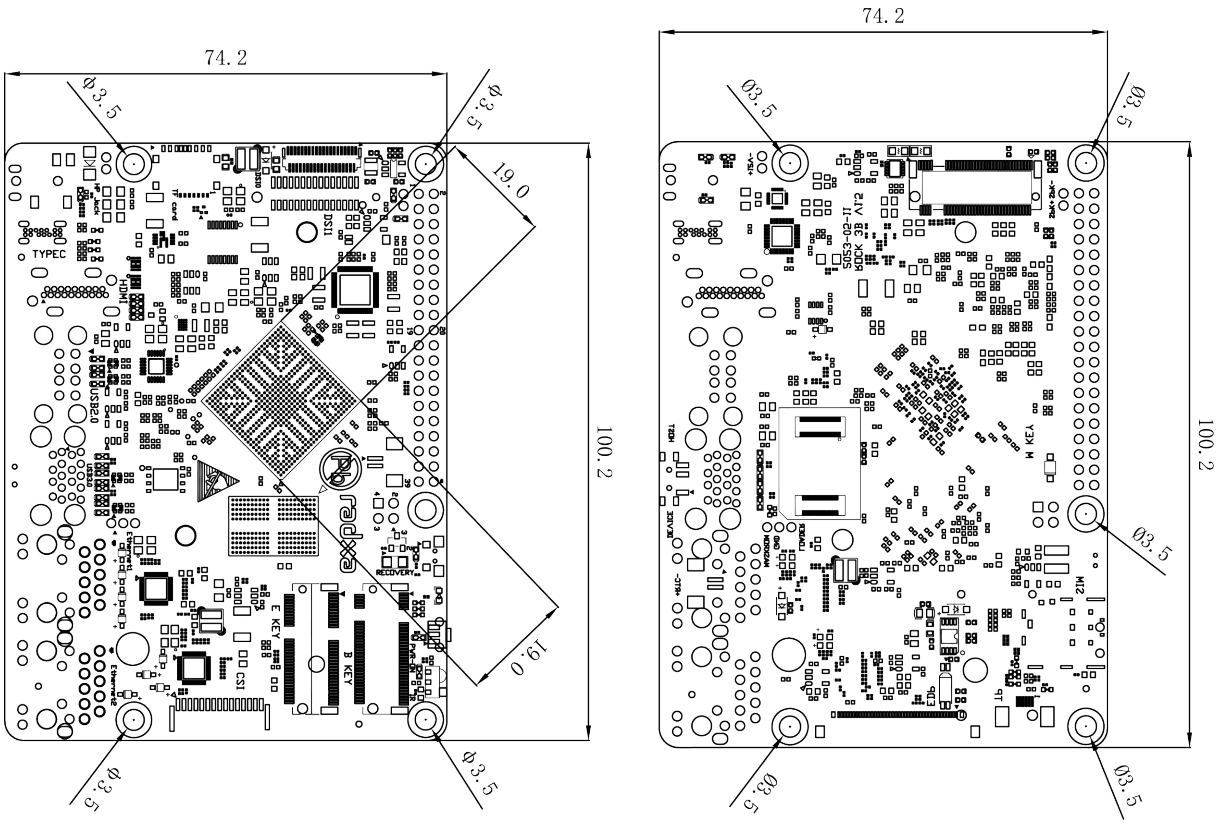
- 1x M.2 E Key Connector for WiFi&BT supports WiFi4/5/6
- 1x M.2 B KeyConnector for 4G cellular with SIM Card Slot
- 1x M.2 M Key Connector for NVMe SSD(PCIe 3.0 2-lane)
- 1x SIM Card Slot
- 1x TF Card Slot
- 1x eMMC module Connector
- 1x HDMI ports supporting displays up to 4Kp60 resolution
- 2x USB2 HOST ports
- 1x USB3 HOST port, 1x USB3 OTG port
- 2x Gigabit Ethernet port (one supports PoE with add-on PoE HAT)
- 1x Camera port (2-lane MIPI CSI)
- 2x Display port (one 2-lane MIPI DSI, one 4-lane MIPI DSI)
- 1x eDP port with touch panel support
- 1x RTC Battery Connector
- 40x user GPIO supporting various interface options:
  - 5 x UART
  - 1 x SPI bus
  - 2 x I2C bus
  - 1 x PCM/I2S
  - 1 x CAN
  - 6 x PWM
  - 1 x ADC
  - 6 x GPIO
  - 2 x 5V DC power in

- 2 x 3.3V power pin

3.3 Software

- ARMv8 Instruction Set
- Debian/Ubuntu Linux support
- Android 11 support
- Hardware access/control library for Linux/Android

4 Mechanical Specification



5 Electrical Specification

5.1 Power Requirements

The ROCK 3B supports various way of powering, smart power adapter as well as fixed voltage:

- USB PD 2.0 Support USB Type C PD 2.0, 9V/2A, 12V/2A, 15V/2A, 20V/2A
- Qualcomm® Quick Charge™ 2.0 Support QC3.0/2.0 adapter, 9V/2A, 12V/1.5A
- Power adapter with fixed voltage from 5.3V to 12V on the USB C power port
- 5V Power from the GPIO PIN 2 & 4
- Gigabit Ethernet port(Close to USB) supports PoE with add-on Radxa 25W PoE HAT

5.2 GPIO Voltage

GPIO	Voltage Level	Tolerance
GPIO3_C0	3.3V	3.63V
ADC_IN5	1.8V	1.98V

6 Peripherals

6.1 GPIO Interface

ROCK 3B offers 40P GPIO expansion which is compatible with most accessories on the market.

6.1.1 GPIO Alternate Functions

Function4	Function3	Function2	Function1	Pin#	Pin#	Function1	Function2	Function3	Function4
			+3.3V	1	2	+5.0V			
CAN1_RX_M0	UART3_RX_M0	I2C3_SDA_M0	GPIO1_A0	3	4	+5.0V			
CAN1_TX_M0	UART3_TX_M0	I2C3_SCL_M0	GPIO1_A1	5	6	GND			
	UART3_TX_M1	PWM12_M0	GPIO3_B7	7	8	GPIO0_D1	UART2_TXD		

Function4	Function3	Function2	Function1	Pin#	Pin#	Function1	Function2	Function3	Function4
			GND	9	10	GPIO0_D0	UART2_RXD		
	UART7_TX_M1	PWM14_M0	GPIO3_C4	11	12	GPIO3_A3			
	UART7_RX_M1	PWM15_IR_M0	GPIO3_C5	13	14	GND			
	UART0_RX	PWM1_M0	GPIO0_C0	15	16	GPIO3_A1	SPI1_CS0_M1		
	UART0_TX	PWM2_M0	GPIO0_C1	17	18	GPIO3_B2	UART4_TX_M1	PWM9_M0	
CAN1_TX_M1	SPI3_MOSI_M1	PWM15_IR_M1	GPIO4_C3	19	20	GND			
UART9_TX_M1	SPI3_MISO_M1	PWM12_M1	GPIO4_C5	21	22	ADC_IN5			
CAN1_RX_M1	SPI3_CLK_M1	PWM14_M1	GPIO4_C2	23	24	GPIO4_C6	PWM13_M1	SPI3_CS0_M1	UART9_RX_M1
			GND	25	26	GPIO4_D1	SPI3_CS1_M1		
PWM2_M1	SPI0_MOSI_M0	I2C2_SDA_M0	GPIO0_B6	27	28	GPIO0_B5	I2C2_CLK_M0	SPI0_CLK_M0	PWM1_M1
	UART8_TX_M1	SPI2_MISO_M1	GPIO2_D7	29	30	GND			
	UART8_RX_M1	SPI2_CLK_M1	GPIO3_A0	31	32	GPIO3_C2	SPI1_MISO_M1	UART5_TX_M1	
	UART5_RX_M1	SPI1_CLK_M1	GPIO3_C3	33	34	GND			
			GPIO3_A4	35	36	GPIO3_A2			
	UART3_RX_M1	PWM13_M0	GPIO3_C0	37	38	GPIO3_A6			
			GND	39	40	GPIO3_A5			

6.2 eMMC Socket

The ROCK 3B features a high-speed eMMC socket designed specifically for eMMC modules, serving as both the operating system and data storage solution. This eMMC socket is fully compatible with the widely adopted industrial pinout and form factor standards.

6.3 Camera Interface

The ROCK 3B is outfitted with a versatile 2-lane MIPI CSI Camera port, promoting compatibility with a wide range of widely used industrial camera peripherals. This not only guarantees flexibility and ease of integration but also empowers users with diverse camera options to suit their specific needs.

6.4 Display Interfaces

The ROCK 3B offers versatile connectivity options, including a 2-lane MIPI DSI Display interface and a 4-lane MIPI DSI/LVDS Display connector. Crucially, these connectors maintain backward compatibility with widely used industrial display peripherals, ensuring both flexibility and straightforward integration.

Additionally, the ROCK 3B is equipped with an eDP interface and a touch screen interface. It adheres to the eDP V1.3 standard with a total of 4 lanes. Through the eDP TX interface, it can achieve an impressive maximum output resolution of 2560X1600@60Hz.

6.5 HDMI

The ROCK 3B is equipped with a single HDMI port that boasts impressive features. It supports CEC (Consumer Electronics Control) and HDMI 2.0, delivering stunning resolutions of up to 4Kp60, ensuring a high-quality visual experience.

6.6 USB

The ROCK 3B boasts a comprehensive USB interface setup, featuring 2x USB2 HOST ports, 1x USB3 HOST port, and 1x USB3 OTG type-A socket. To ensure stable performance, the aggregate downstream USB current across all four sockets is capped at approximately 2.8A. Additionally, a hardware switch is provided for seamless toggling between USB3 HOST and Device modes, enhancing usability and versatility.

6.7 Audio Jack

The ROCK 3B offers exceptional analog audio capabilities through a 4-ring 3.5mm headphone jack, providing near-CD-quality output. This analog audio output is potent enough to directly power 32 Ohm headphones, ensuring a robust and immersive audio experience.

6.8 M.2 M Key Connector

The ROCK 3B presents an M.2 M Key 2280 SSD socket with PCIe 3.0 x2-lane interfaces, delivering swift and efficient storage access, synonymous with high-speed performance.

6.9 M.2 E Key Connector

The ROCK 3B boasts an M.2 E Key socket, offering a versatile array of interfaces including SDIO, UART, PCIe 2.0, SATA, and USB. This configuration greatly facilitates high-speed WiFi and Bluetooth connectivity, including support for the latest WiFi 6 standards. The socket is fully compatible with standard M.2 wireless modules of the SDIO variety, ensuring effortless integration and bolstering wireless capabilities.

6.10 M.2 B Key Connector

The ROCK 3B offers a USB interface through its M.2 B Key socket. When combined with a SIM card (the ROCK 3B features a SIM slot), it enables high-speed 4G mobile phone connectivity and guarantees compatibility with standard M.2 3042 B Key modules.

7 Temperature Range and Thermals

The community version of ROCK 3B is designed for an environmental operating temperature range of 0°C to 50°C, while the industrial version of ROCK 3B is capable of operation within a broader temperature range spanning from -40°C to 85°C.

When the CPU temperature reaches 75°C, the CPU frequency is automatically reduced in order to prevent overheating and maintain optimal performance. This proactive temperature management ensures that the CPU operates within safe limits, prolonging its lifespan and preventing potential damage.

The ROCK 3B can operate smoothly without the need for additional cooling and is engineered for burst performance, catering to typical light-duty use cases while dynamically increasing CPU speed as required (e.g., during webpage loading). If users intend to run the system continuously or operate it at elevated temperatures while maintaining peak performance, we recommend adding a heat sink to enhance both performance and stability.

8 Model and SKU

Temperature Range	DRAM	SKU
-40°C to 85°C	2GB	RS118-D2J1
	4GB	RS118-D4J1
	8GB	RS118-D8J1
0°C to 50°C	2GB	RS118-D2J0
	4GB	RS118-D4J0
	8GB	RS118-D8J0

9 Availability

Radxa guarantee availability Radxa ROCK 3B until at least September 2033.

10 Support

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