RUBIK Pi 3 Datasheet

Revision: V1.2.2

Date: Aug 12, 2025

Revision History

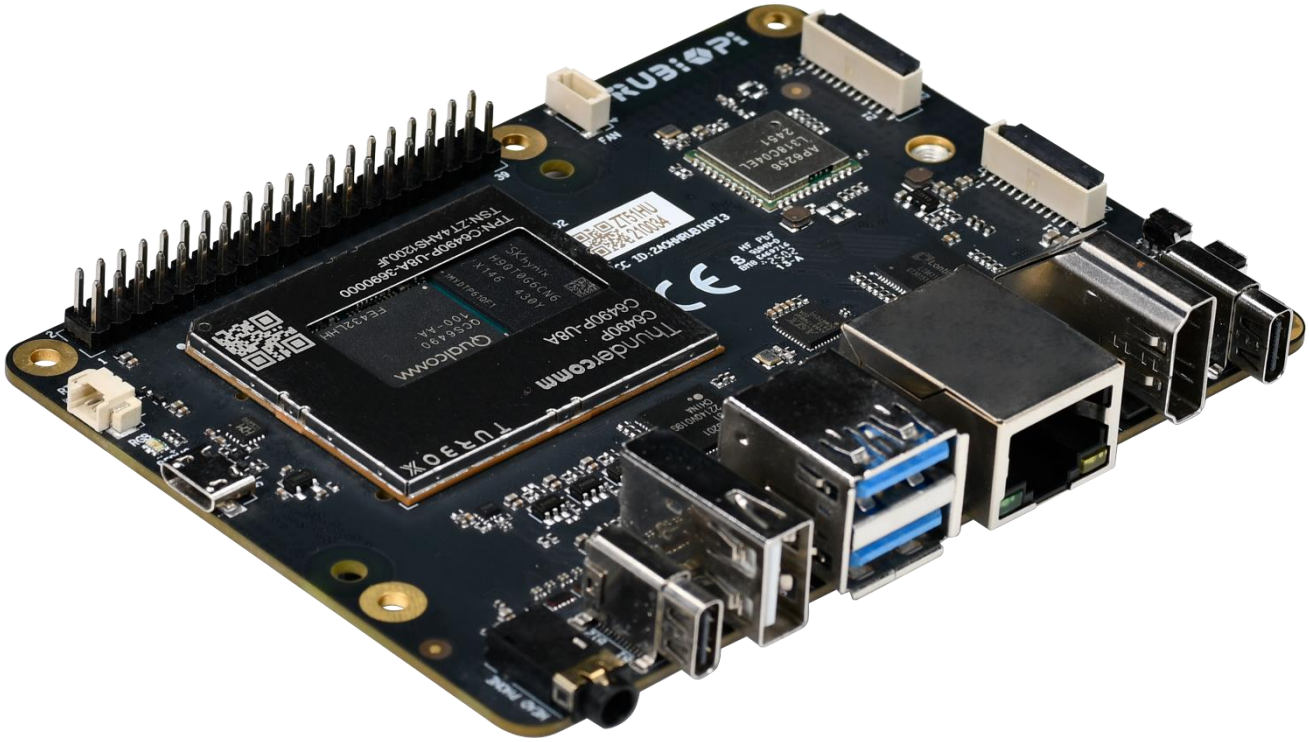
Revision	Date	Description
1.0	Dec 09, 2024	Initial release.
1.1	Mar 14, 2025	• Added Figure 3-1 and Appendix 1. • Updated Table 3-1. • Added Debian 12 to the OS support. • Updated all RUBIK Pi 3 V01 figures to RUBIK Pi 3 V02. • Changed the operating temperature to -20°C – 70°C. • Updated definitions of the 40-pin LS connector.
1.2	Mar 26, 2025	• Added a note to Table 3-3.
1.2.1	May 29, 2025	• Updated the supported operating system from Debian 12 to Debian 13. • Updated the operating temperature to -20°C – 75°C. • Updated the description about the Ethernet connector and updated the Ethernet indicator diagram. • Added the certification information and deleted Appendix 1.
1.2.2	Aug 08, 2025	• Updated the operating temperature to 0°C – 50°C. • Updated Figure 2-2. • Updated the OS support.

Copyright © 2025 RUBIK Pi. All rights reserved.

Table of Contents

Copyright © 2025 RUBIK Pi. All rights reserved.

Chapter 1. Overview



Category	RUBIK Pi 3 Feature
Platform	Qualcomm® QCS6490
Memory	RAM 8 GB LPDDR4x ROM 128 GB UFS 2.2
Video	1 x HDMI 1.4 output (up to 4K 30 Hz) 1 x DP over USB Type-C (up to 4K 60 Hz) 2 x camera connector (4-lane MIPI CSI D-PHY)
Audio	1 x 3.5mm headphone jack
Connectivity	1 x USB Type-C (USB 3.1 Gen 1) 2 x USB Type-A (USB 3.0) 1 x USB Type-A (USB 2.0) 1 x Ethernet port (1000/100/10 Mbps full duplex auto-negotiation) 1 x UART for debug (over Micro USB) 1 x M.2 Key M connector (PCIe 3.0 x 2) 40-pin LS connector supporting various interface options: • Up to 28 x GPIO • Up to 2 x I2C • Up to 3 x UART • Up to 3 x SPI • 1 x I2S (PCM) • 1 x PWM channel

Category	RUBIK Pi 3 Feature
Others	1 x PWR button 1 x EDL button 1 x RGB LED 2-pin RTC battery connector 4-pin PWM fan connector
Wireless Connection	Wi-Fi: IEEE 802.11 a/b/g/n/ac Wi-Fi Bluetooth: BT 5.2 On-board PCB antenna
Power Supply	Power Delivery over Type-C, 12V 3A
Operating Environment	Operating temperature: 0°C – 50°C
Dimensions	100mm x 75mm x 25mm
OS Support	Android 13 Qualcomm Linux Debian 13 Canonical Ubuntu for Qualcomm platforms
Certification	CE, FCC, JATE, UKCA, WPC, RoHS, REACH, WEEE, CA65, TSCA

Chapter 2. Features

2.1. System block diagram

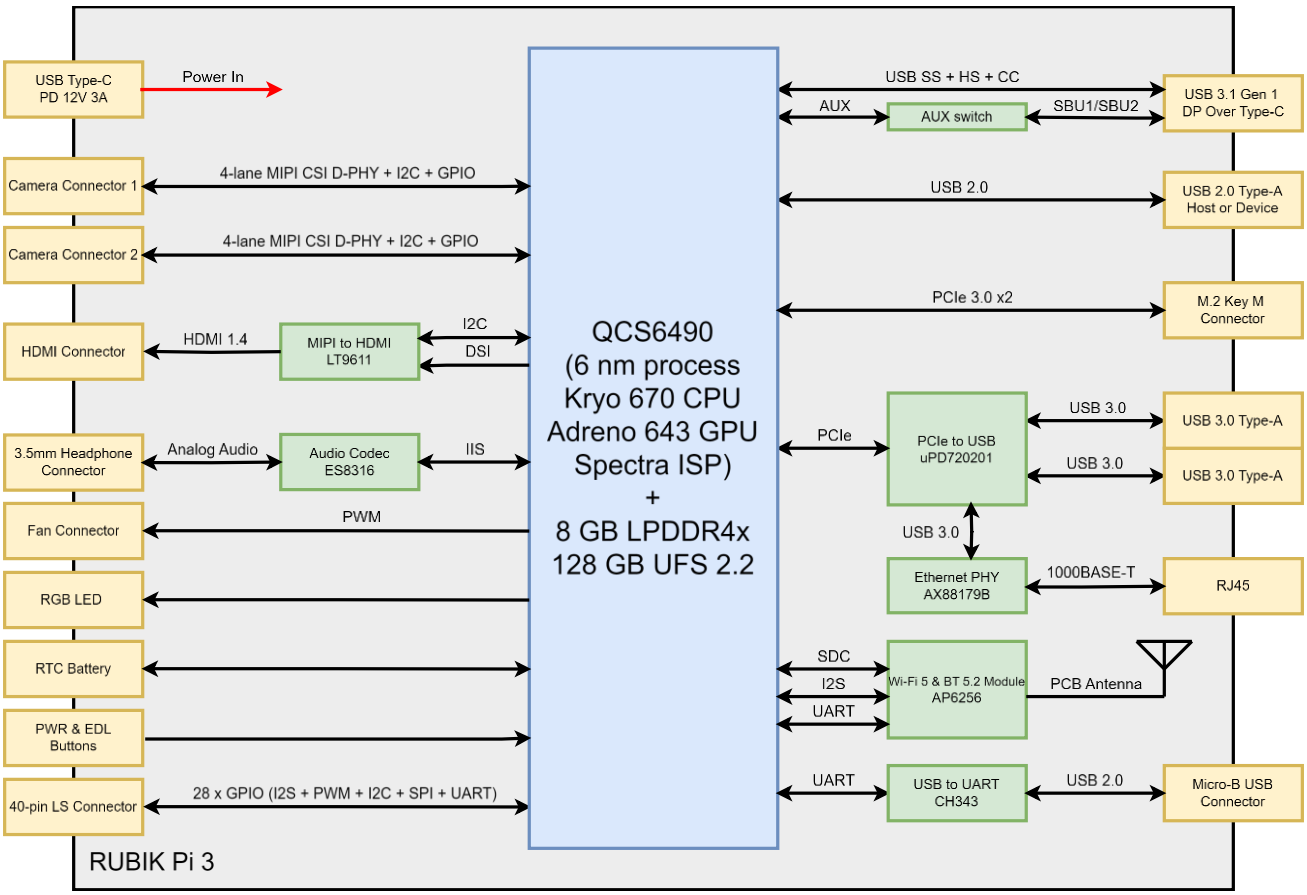


Figure 2-1. RUBIK Pi 3 System Block

2.2. Component locations

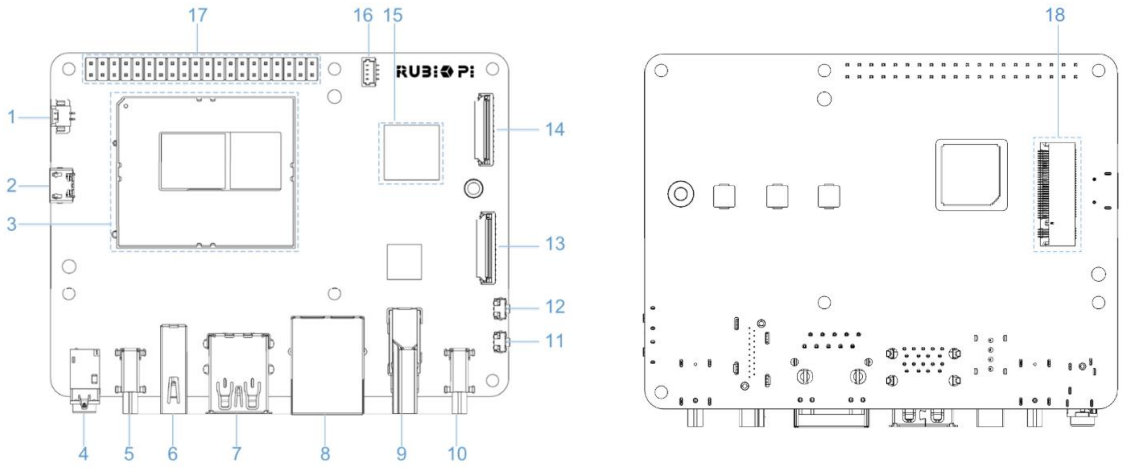


Figure 2-2. Locations of Major Components

Table 2-1. Interface list

No.	Interface	No.	Interface
1	RTC battery connector	10	Power Delivery over Type-C
2	Micro USB (UART debug)	11	PWR button
3	TurboX C6490P SOM	12	EDL button
4	3.5mm headphone jack	13	Camera connector 2
5	USB Type-C with DP (USB 3.1)	14	Camera connector 1
6	USB Type-A (USB 2.0)	15	Wi-Fi/BT module
7	2 x USB Type-A (USB 3.0)	16	Fan connector
8	1000M Ethernet	17	40-pin LS connector
9	HDMI OUT	18	M.2 Key M connector

2.3. Electrical characteristics

2.3.1. Power supply requirements

Rubik Pi 3 supports Power Delivery (PD) 3.0 power input. A Type-C 12V 3A power adapter compliant with PD 3.0 is recommended for input power.

The power indicator LED (in yellow green) will turn on if the power adapter meets requirements and power negotiation succeeds. If the adapter does not meet requirements, the LED will remain off and the device will not boot.

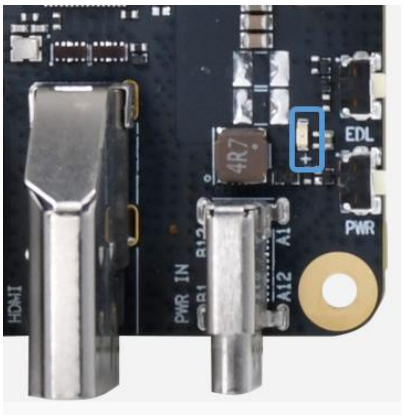


Figure 2-3. Power Indicator

2.3.2. Output power requirements

The following table lists the maximum current output from each connector with a 12V 3A power supply.

Table 2-2. Maximum current output from each connector

Connector	Output Voltage	Max. Output Current	Remarks
USB 3.0 Type-A – 1	5V	1.5A	The total current simultaneously output from the three USB ports cannot exceed 3A.
USB 3.0 Type-A – 2	5V	1.5A	
USB 2.0 Type-A	5V	1.5A	
40 Pin GPIO	5V	1A	
	3.3V	1A	
HDMI	5V	100mA	
M.2 Key M	3.3V	1A	
Camera 1	3.3V	300mA	
Camera 2	3.3V	300mA	

An output current exceeding the maximum threshold will trigger output power protection or a system restart.

It is NOT recommended to use the USB port of RUBIK Pi 3 to supply power to USB devices with high power consumption, such as USB fans, speakers, or displays.

2.4. Mechanical specification

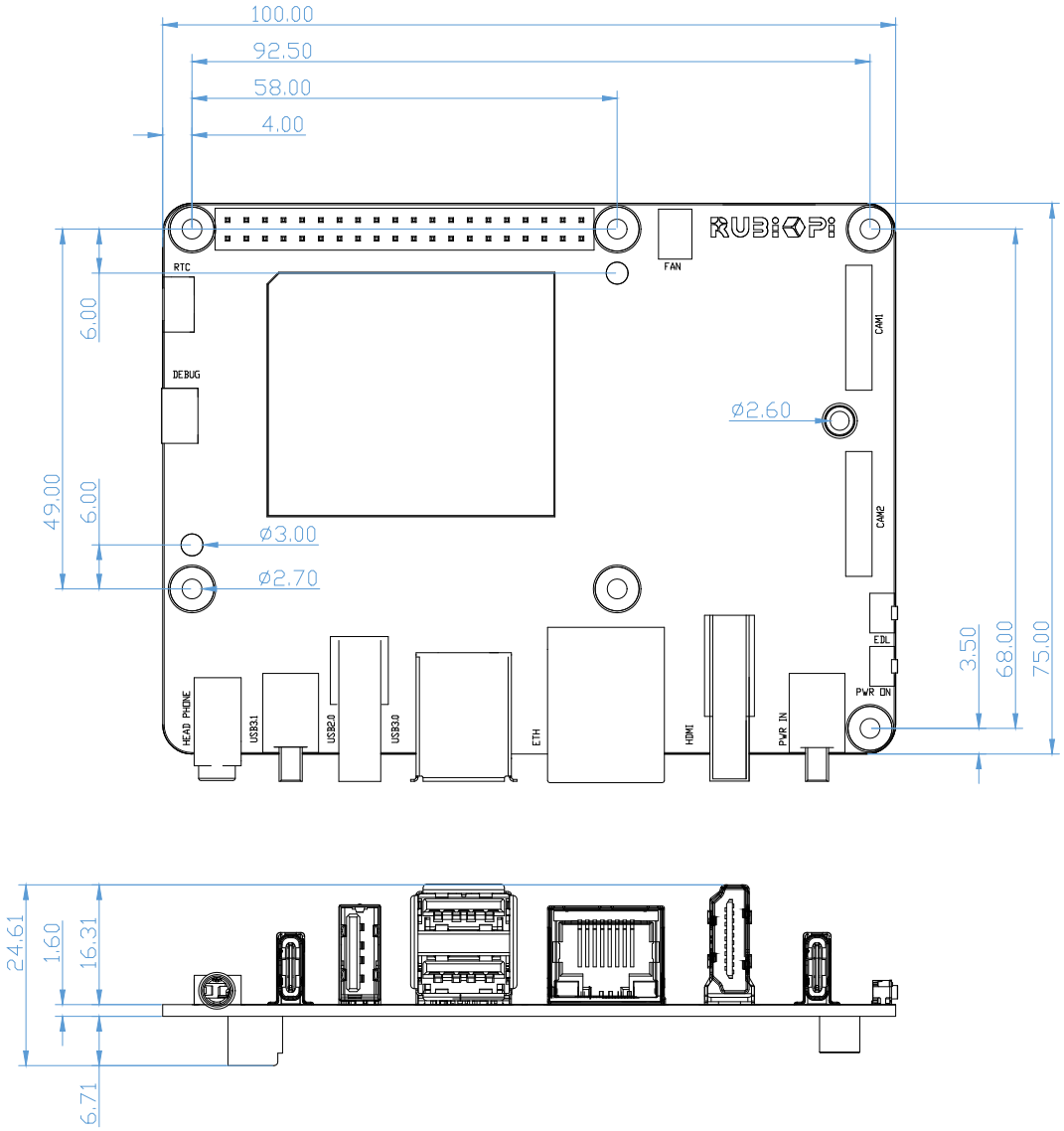


Figure 2-4. RUBIK Pi 3 Dimensions

*All dimensions are in millimeters.

Chapter 3. Expansion Connections

3.1. 40-pin LS connector

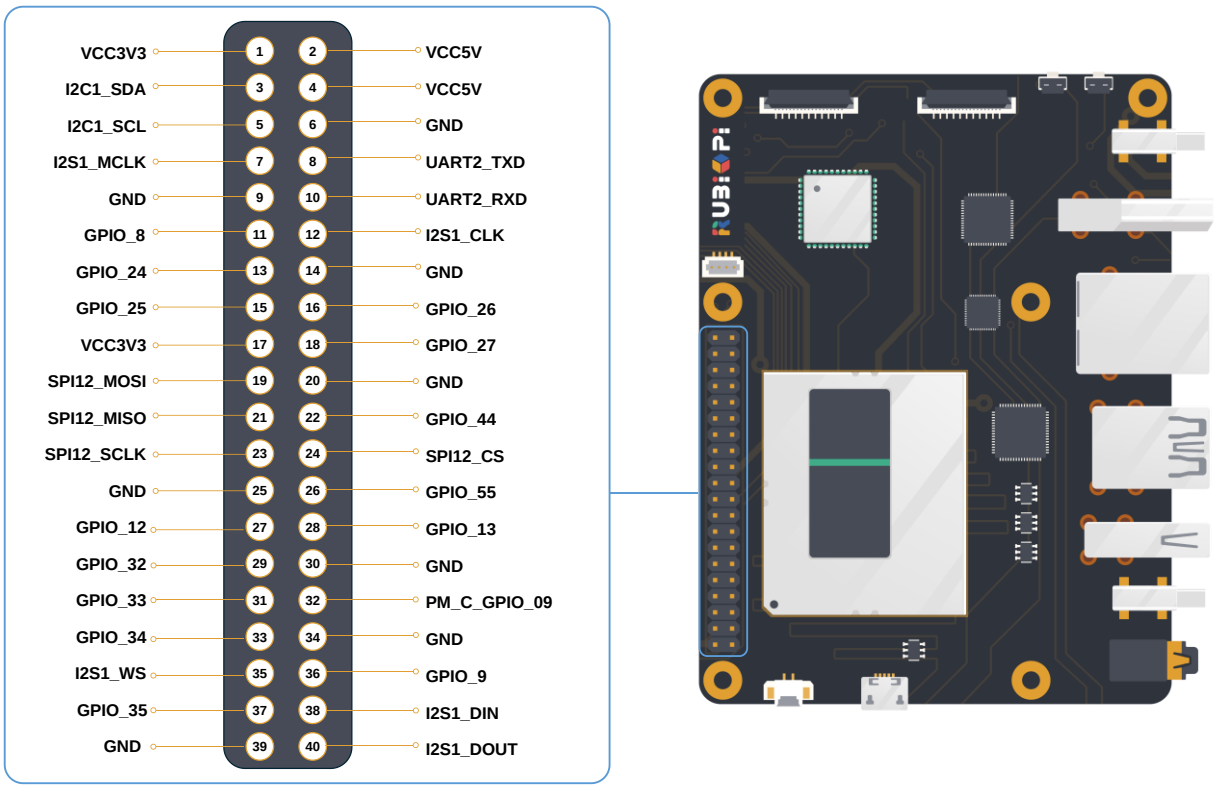


Figure 3-1. Default Functions of the 40-pin Connector Pins

Table 3-1. Pin definitions of the 40-pin LS connector

Fuction5	Fuction4	Fuction3	Fuction2	Fuction1	Pin#	Pin#	Fuction1	Fuction2	Fuction3	Fuction4	Fuction5	Fuction6
VCC3V3					1	2	VCC5V					
			I2C1_SDA	GPIO_4	3	4	VCC5V					
			I2C1_SCL	GPIO_5	5	6	GND					
I2S1_MCLK				GPIO_105	7	8	GPIO_10		SPI2_SCLK	UART2_TXD		
GND					9	10	GPIO_11		SPI2_CS	UART2_RXD		
	UART2_CTS	SPI2_MISO	I2C2_SDA	GPIO_8	11	12	GPIO_101				I2S1_CLK	
	UART6_CTS	SPI6_MISO	I2C6_SDA	GPIO_24	13	14	GND					
	UART6_RTS	SPI6_MOSI	I2C6_SCL	GPIO_25	15	16	GPIO_26		SPI6_SCLK	UART6_TXD		
VCC3V3					17	18	GPIO_27		SPI6_CS	UART6_RXD		
	UART12_RTS	SPI12_MOSI	I2C12_SCL	GPIO_49	19	20	GND					
	UART12_CTS	SPI12_MISO	I2C12_SDA	GPIO_48	21	22	GPIO_44					
	UART12_TXD	SPI12_SCLK		GPIO_50	23	24	GPIO_51		SPI12_CS	UART12_RXD		
GND					25	26	GPIO_55					
			I2C3_SDA	GPIO_12	27	28	GPIO_13	I2C3_SCL				
	UART8_CTS	SPI8_MISO	I2C8_SDA	GPIO_32	29	30	GND					
	UART8_RTS	SPI8_MOSI	I2C8_SCL	GPIO_33	31	32	PM_C_GPIO_09					PWM
	UART8_TXD	SPI8_SCLK		GPIO_34	33	34	GND					
I2S1_WS				GPIO_103	35	36	GPIO_9	I2C2_SCL	SPI2_MOSI	UART2_RTS		
	UART8_RXD	SPI8_CS		GPIO_35	37	38	GPIO_102				I2S1_DIN	
GND					39	40	GPIO_104				I2S1_DOUT	

* Functions bolded in blue are default functions.

RUBIK Pi 3 provides 28 GPIOs. By default, 2 x I2C, 1 x UART, 1 x SPI, 1 x I2S, 1 x PWM IO, and 9 GPIOs are configured.

The level of all GPIOs is 3.3V. The I2C GPIOs (GPIO 4, 5, 12, 13) are in open-drain output mode with 4.7 kΩ pull-up resistors. The other GPIOs are in push-pull output mode, and the external pull-up or pull-down resistors of the connected signals cannot be less than 50 kΩ due to the limitations of the on-board level shifter IC.

The GPIOs belonging to the same QUP group can be flexibly configured as UART or SPI. For details, refer to the user manual.

The 2.54mm pitch 40-pin LS connector is compatible with the expansion boards of most open-source development boards.

3.2. HDMI connector

RUBIK Pi 3 comes with a standard-sized HDMI connector that is compatible with HDMI 1.4. This connector supports a maximum output of 4K 30 Hz. Additionally, it provides the Consumer Electronics Control (CEC) functionality, as well as 5V DDC and HPD interfaces.

3.3. Ethernet connector

RUBIK Pi 3 is equipped with a standard RJ45 connector featuring Link and Active indicator LEDs. This connector supports high-speed communication at up to 1000 Mbps in full duplex mode, with backward compatibility for 100/10 Mbps via auto-negotiation.

Figure 3-2. Link and Active Indicators

3.4. USB connector

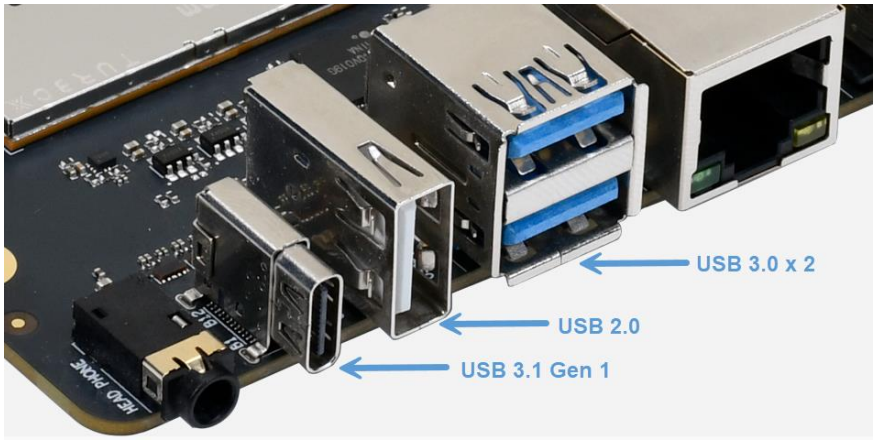


Figure 3-3. USB Ports

3.4.1. USB 3.1 Gen 1 Type-C

RUBIK Pi 3 incorporates a USB 3.1 Gen 1 Type-C port that supports Type-C with DisplayPort v1.4. The port allows for a maximum output of 4K 60 Hz when used with a Type-C to DP cable and supports read/write operations at speeds of up to 5 Gbps.

By default, this port is used for ADB debugging.

3.4.2. USB 3.0 Type-A

RUBIK Pi 3 features two standard USB 3.0 Type-A ports, each supporting read and write operations at speeds of up to 4 Gbps.

The USB 3.0 Type-A port can operate in host mode only. Each individual port has a maximum output capacity of 5V 1.5A. The power output of each port can be individually controlled.

3.4.3. USB 2.0 Type-A

RUBIK Pi 3 is equipped with a standard USB 2.0 Type-A port which supports read and write operations at speeds of up to 480 Mbps. This port works in host mode by default and can be switched to device mode and used as an ADB interface by using software. The maximum output capacity of this port is 5V 1.5A, while the total output of all three USB Type-A ports is 3A. The power output of this port can be individually controlled.

3.5. 3.5mm audio connector

The 3.5mm audio connector is designed according to CITA standard and supports left and right channels and microphone inputs.

The following figure shows the rings on the plug. From right to left, they are: 1-left channel, 2-right channel, 3-ground, 4-microphone.

Figure 3-4. Headphone Plug

Table 3-2. Pin definitions of the 3.5mm audio connector

Pin No.	Pin Name
1	Left channel
2	Right channel
3	GND
4	Mic

3.6. Camera connector

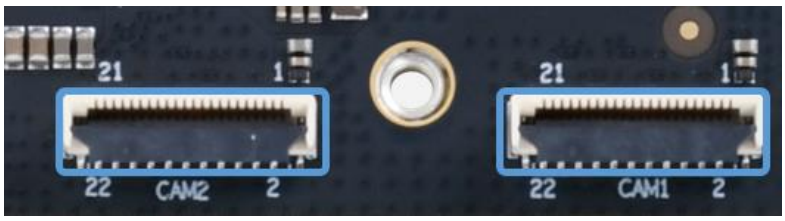


Figure 3-5. Camera Connectors

RUBIK Pi 3 provides two 22-pin camera connectors. Each connector supports 4-lane MIPI CSI D-PHY and provides one I2C and two control GPIOs. The GPIO level is 3.3V, and the I2C signal is in open-drain mode with pull-up resistors. The pitch of the connector is 0.5mm and the connector is pin-to-pin compatible with the camera interfaces of mainstream development boards. For details, refer to the PVL list of accessories.

Table 3-3. Pin definitions of the camera connectors

Camera Connector 1		Camera Connector 2	
Pin Name	**Pin No.***	**Pin No.***	**Pin Name**
GND	22	22	GND
CSI0_LN0_M	21	21	CSI1_LN0_M
CSI0_LN0_P	20	20	CSI1_LN0_P
GND	19	19	GND
CSI0_LN1_M	18	18	CSI1_LN1_M
CSI0_LN1_P	17	17	CSI1_LN1_P
GND	16	16	GND
CSI0_CLK_M	15	15	CSI1_CLK_M
CSI0_CLK_P	14	14	CSI1_CLK_P
GND	13	13	GND
CSI0_LN2_M	12	12	CSI1_LN2_M
CSI0_LN2_P	11	11	CSI1_LN2_P
GND	10	10	GND
CSI0_LN3_M	9	9	CSI1_LN3_M
CSI0_LN3_P	8	8	CSI1_LN3_P
GND	7	7	GND
CAMERA1_PWR_EN(GPIO_57)	6	6	CAMERA2_PWR_EN(GPIO_58)
CAMERA1_GPIO(GPIO_18)	5	5	CAMERA2_GPIO(GPIO_19)
GND	4	4	GND
CAMERA1 I2C_SCL(GPIO_74)	3	3	CAMERA2 I2C_SCL(GPIO_70)
CAMERA1_I2C_SDA(GPIO_73)	2	2	CAMERA2_I2C_SDA(GPIO_69)
VCC3V3_OUT	1	1	VCC3V3_OUT

* This datasheet is for the updated camera connectors, which facilitate user operations and do not have performance difference compared to the original ones. If you use the beta version hardware (marked with V01 on the board), refer to *RUBIK Pi 3 V01 (Beta Version) Datasheet*.

3.7. M.2 connector

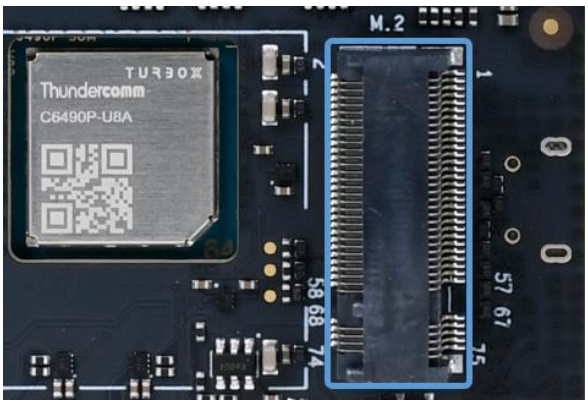


Figure 3-6. M.2 Connector

RUBIK Pi 3 provides an M.2 slot for NVMe storage, which can be used to install 2280-sized SSD hard drives. The M.2 Key M slot supports PCIe 3.0 x2 and can deliver an output of up to 3.3V 2A. The switch of the M.2 connector can be individually controlled.

Table 3-4. Pin definitions of the M.2 connector

Pin Name	Pin No.	Pin No.	Pin Name
GND	1	2	VCC3V3_OUT
GND	3	4	VCC3V3_OUT
NC	5	6	NC
NC	7	8	NC
GND	9	10	NC
NC	11	12	VCC3V3_OUT
NC	13	14	VCC3V3_OUT
GND	15	16	VCC3V3_OUT
NC	17	18	VCC3V3_OUT
NC	19	20	NC
GND	21	22	NC
NC	23	24	NC
NC	25	26	NC
GND	27	28	NC
PCIE1_RX1_M	29	30	NC
PCIE1_RX1_P	31	32	NC
GND	33	34	NC

Pin Name	Pin No.	Pin No.	Pin Name
PCIE1_TX1_M	35	36	NC
PCIE1_TX1_P	37	38	NC
GND	39	40	NC
PCIE1_RX0_M	41	42	NC
PCIE1_RX0_P	43	44	NC
GND	45	46	NC
PCIE1_TX0_M	47	48	NC
PCIE1_TX0_P	49	50	PCIE_RESET_N(1)
GND	51	52	PCIE_CLK_REQ_N(1)
PCIE1_REFCLK_M	53	54	PCIE_WAKE_N(1)
PCIE1_REFCLK_P	55	56	NC
GND	57	58	NC
…	…	…	…
NC	67	68	NC
NC	69	70	VCC3V3_OUT
GND	71	72	VCC3V3_OUT
GND	73	74	VCC3V3_OUT
GND	75		

(1). The level of the PCIe control IOs is 3.3V.

3.8. Wi-Fi

RUBIK Pi 3 integrates the on-board wireless communication module that supports IEEE 802.11 a/b/g/n/ac Wi-Fi. The on-board PCB antenna is provided, eliminating the need for additional antennas.

3.9. Bluetooth

The on-board wireless communication module of RUBIK Pi 3 also provides the BT 5.2 function for Bluetooth data transfer and Bluetooth audio applications. The Bluetooth shares the PCB antenna with Wi-Fi, eliminating the need for additional antennas.

3.10. Fan connector

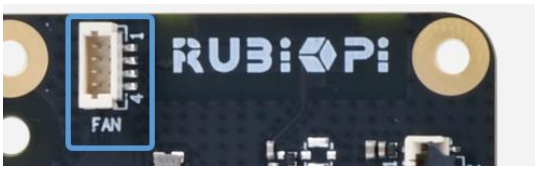


Figure 3-7. Fan Connector

The fan connector of RUBIK Pi 3 is a 4-pin 1mm pitch connector which is suitable for 5V fans whose maximum rated current is smaller than 200 mA. The fan connector supports PWM control. For the fan compatible with its pin definition and board mounting holes, refer to the PVL list of accessories.

Table 3-5. Pin definitions of the fan connector

Pin No.	Pin Name
1	NC
2	GND
3	PWM_OUT(1)
4	VCC5V_OUT

(1). The level of PWM_OUT is 5V.

3.11. RTC battery connector

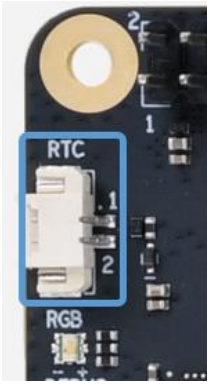


Figure 3-8. RTC Battery Connector

RUBIK Pi 3 includes a 2-pin 1.25mm pitch RTC battery connector, only compatible with 3V coin cell batteries. The voltage range for normal operation is 2V – 3.25V.

Table 3-6. Pin definitions of the RTC battery connector

Pin No.	Pin Name
1	VCC3V_IN
2	GND

3.12. Micro USB to UART for debug

Figure 3-9. Micro USB

RUBIK Pi 3 incorporates the CH343, a USB to UART TTL bridge IC made by WinChipHead (WCH). UART logs from the SoC can be obtained through connecting the device to a computer via micro USB.

The default UART setting is 115200 baud rate, 8 data bits,1 stop bit, and no parity.

Download the CH343 driver at the official website: Driver.

3.13. Button

3.13.1. PWR button

Plug in the power supply and press the **[PWR]** button once to boot up the device. If the indicator light flashes once, it indicates that the device has powered on successfully and is starting to operate.

3.13.2. EDL button

The EDL button is for Emergency Download mode. To enter EDL mode (9008), connect the power supply, then press and hold both the **[PWR]** and **[EDL]** buttons for more than 3 seconds.

3.14. LED

3.14.1. Power indicator LED

When a compliant (12V 3A, PD-supported) power supply is connected, the indicator LED lights steadily in yellow-green, indicating that the device is ready.

Figure 3-10. Power Indicator LED

3.14.2. RGB LED

RUBIK Pi 3 is equipped with an on-board RGB LED that supports PWM dimming.

Figure 3-11. RGB LED

Chapter 4. Precautions

4.1. Operating environment

The ambient operating temperature range for RUBIK Pi 3 is 0°C – 50°C. While using RUBIK Pi 3, please closely monitor the CPU temperature and take appropriate cooling measures to ensure it stays below 85°C. This will help avoid CPU throttling or performance degradation. Prolonged use of the device in high-temperature conditions may cause irreversible damage to the hardware.

4.2. ESD prevention

Prevent electrostatic discharge (ESD) and avoid touching any components on the board under any circumstances.

4.3. Warning

Any external power supply used with RUBIK Pi 3 must comply with the relevant regulations and standards of the country in which it is used. The power supply should provide 12V DC and a minimum rated current of 3A.

4.4. Safety instructions

- This product should not be overclocked.
- Do not operate this product in water or humid environments.
- Do not place this product on conductive surfaces.
- Keep this product away from heat sources. It is designed for use at normal room temperature to ensure reliable operation.
- Do not expose the circuit board to high-intensity light sources, such as xenon flashlights or lasers.
- Operate this product in a well-ventilated environment, and do not cover it during use.
- Place this product on a stable, flat, and insulated surface and avoid contact with conductive materials.
- Handle this product carefully to prevent mechanical or electrical damage to the printed circuit board and connectors.
- Avoid touching or handling the product when it is powered on. Only touch the edges of the product to minimize the risk of electrostatic discharge damage. Any peripherals or devices used with RUBIK Pi 3 must comply with the relevant standards of the country in which it is used and be appropriately marked to ensure safety and performance requirements are met.