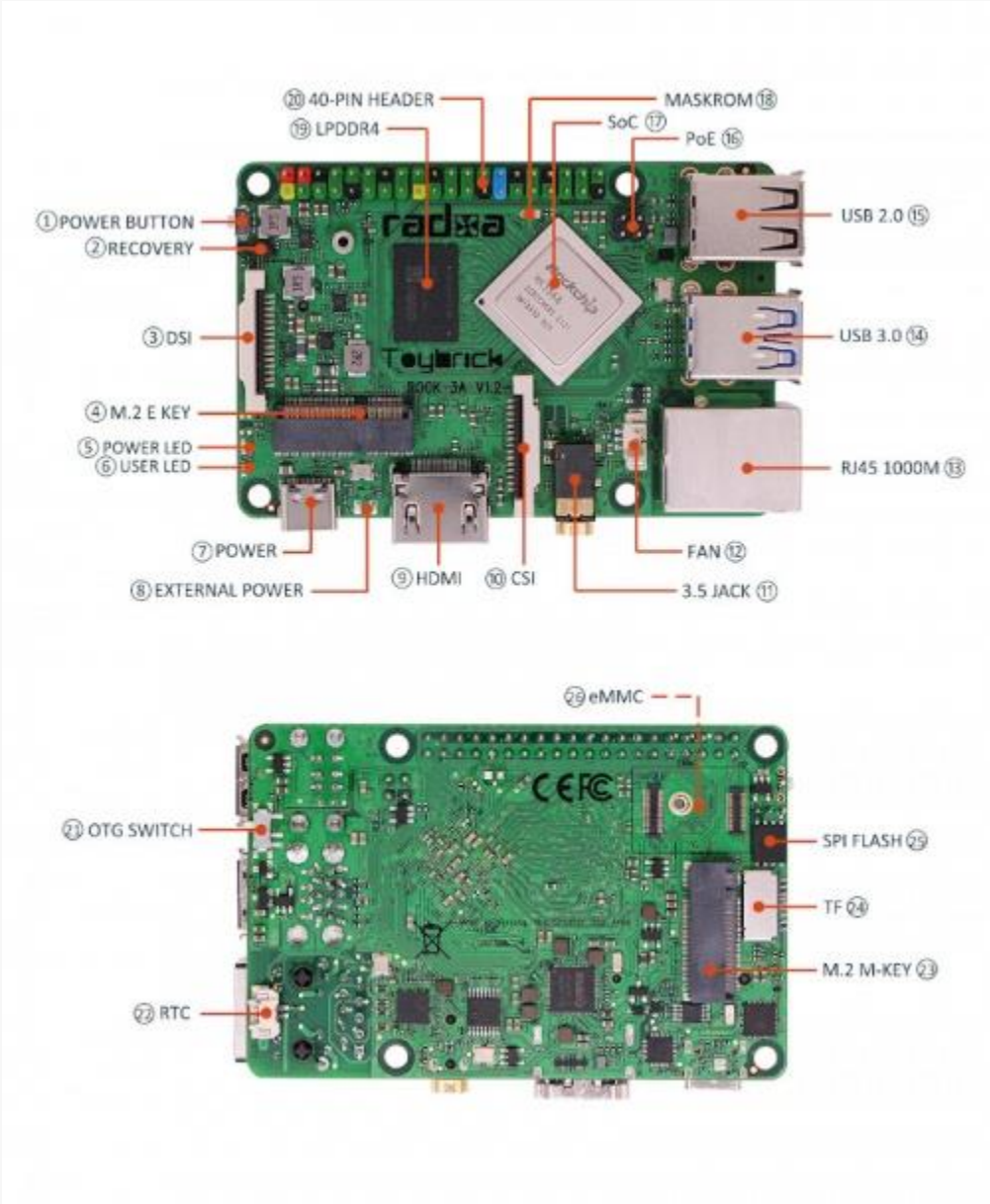
ROCK 3 Model A Main Board

This hardware user manual provides information about the features and signals available on ROCK 3A board.



1.Power Button

The power button is used to turn the device on or off.

Short-pressing power button would power on/off the device. This is what we called power on/off via software.

Power button also provides function of hardware power on/off the device.

When the system is crashed, you can shutdown the device via this method. Press and hold the power button for at least 6 seconds. Then release the power button. After that short press power button would power on the device.

2.3-pin Recovery Header

This is the 3-pin definition table.

Pin#	Name
1	FSPI_CLK
2	GND
3	RECOVERY

About FSPI_CLK pin

Short-circuit the FSPI_CLK pin and GND pin to make SPI Nor flash unavailable.

Please note that you should short-circuit pin#1 and pin#2 always when spi nor flash is not used. Like the yellow left hat.

About Recovery pin

Short-circuit Recovery pin and GND pin to boot device into loader mode.

Below is the steps of booting device into loader mode.

- Install Linux/Android image(or at least u-boot images included) to SPI Nor flash or eMMC on board
- Short-circuit pin#2 and pin#3
- Plug the USB Male A to Male A cable to ROCK 3A OTG port(the upper USB3.0 port), the other side to PC
- Plug in the Type-C adapter
- Wait for about 5 seconds
- Confirm ROCK 3A is in loader mode

```
   For Linux PC: lsusb shows: Bus 001 Device 049: ID 2207:350a Fuzhou
Rockchip Electronics Company

   For macOS PC: lsusb shows: Bus 000 Device 004: ID 2207:350a Fuzhou
Rockchip Electronics Co., Ltd. USB download gadget

   For Windows PC: Open RKDevTool and you would see "Found One LOADER
Device".
```

- Remove wire between pin#2 and pin#3 before flashing images to boot device.

3.MIPI Display Interface

The ROCK 3A is equipped with one HDMI connector and one MIPI DSI. As for HDMI, the maximum resolution is 4k@60Hz. Any HDMI monitor should work as a display for ROCK 3A. As for MIPI DSI, it is designed for raw LCD pannel. HDMI and MIPI DSI can work at the same time.

The MIPI DSI interface pin specification shows below.

Pin#	Name
1	VCC_MIPI
2	VCC_MIPI
3	GND
4	I2C_SDA_AUDIO
5	I2C_SCL_AUDIO
6	GND
7	MIPI_TX/RX_D0P
8	MIPI_TX_RX_D0N
9	GND
10	MIPI_TX/RX_CLKP
11	MIPI_TX_RX_CLKN

12	GND
13	MIPI_TX/RX_D1P
14	MIPI_TX/RX_D1N
15	GND

4.M.2 E Key

M.2 E Key pin signal definition table.

Pin#	Name
1	GND
2	VCC3V3_WF
3	USB2_M2_DP
4	VCC3V3_WF
5	USB2_M2_DM
6	WIFI_LED
7	GND
8	PCM_CLK/I2S_SCK

9	SDIO_CLK
10	PCM_SYNC/I2S_WS
11	SDMMC2_CMD_M0
12	PCM_OUT/I2S SD_OUT
13	SDMMC2_D0_M0
14	PCM_IN/I2S SD_IN
15	SDMMC2_D1_M0
16	NC
17	SDMMC2_D2_M0
18	GND
19	SDMMC2_D3_M0
20	BT_WAKE_HOST_H_GPIO4_B4
21	WIFI_WAKE_HOST_H_GPIO3_D5
22	UART1_RX_M0

23	WIFI_REG_ON_H_GPIO3_D4
32	UART1_TX_M0
33	GND
34	UART1_CTS_M0
35	PCIE_TXP
36	UART1_RTS_M0
37	PCIE_TXN
38	NC
39	GND
40	NC
41	PCIE20_RXP
42	BT_REG_NO
43	PCIE20_RXN
44	NC

45	GND
46	NC
47	PCIE20_REFCLKP
48	NC
49	PCIE20_REFCLKN
50	WIFIBT_32KIN_1T1R
51	GND
52	PCIE_PERSTN
53	PCIE_CLKREQN
54	HOST_WAKE_BT_H
55	PCIE_WAKEN
56	BT_REG_ON_H
57	GND
58	I2C4_SDA_M1

59	NC
60	I2C4_SCL_M1
61	NC
62	NC
63	GND
64	NC
65	NC
66	NC
67	NC
68	NC
69	GND
70	BT_WAKE
71	NC
72	VCC3V3_WF

73	NC
74	VCC3V3_WF
75	GND
76	GND
77	GND
78	NC
79	NC

M.2 E-Key slot supports the following WiFi/BT cards (include but not as least).

Model	Chip	WiFi	BT	Others
ROCK Pi Wireless Module A1(SDIO+UART)	BCM43436B0	2.4G	4.2	
ROCK Pi Wireless Module A2(SDIO+UART)	BCM43456	2.4G&5G	5.0	
ROCK Pi Wireless Module A3(SDIO+UART)	BCM43598	2.4G&5G	5.0	Support RSDB
ROCK Pi Wireless Module A6(SDIO+UART)	BCM43752	2.4G&5G, WiFi 6	5.0	
Realtek RTL8723BE(PCIe)	RTL8723BE	2.4G	4.0	

Realtek RTL8822CE(PCIe)	RTL8822CE	2.4G&5G	5.0	
Intel 0MHK36(PCIe+USB)	Intel 3165	2.4G&5G	4.2	
Intel 7265NGW(PCIe+USB)	Intel 7265	2.4G&5G	4.2	

5.Power LED

Green power LED is always on when ROCK 3A is given power.

6.User LED

Blue user LED can be controlled via software. You can indicate the status of system application by controlling its working behavior.

7.Power Supply

The ROCK 3A is powered by Type-C port and has a wide range of input voltage, from 9V to 21V. The ROCK 3A supports USB Type-C PD 2.0 with 9V/2A, 12V/2A, 15V/2A and 20V/2A. Besides, the Pi supports QC 3.0/2.0 with 9V/2A and 12V/1.5A. The Type-C cable you using needs to support data communication. We call it USB Type-C charging data cable.

8.External Power

The voltage of external power is DC 12V.

9.HDMI

The ROCK 3A is equipped with one HDMI connector and one MIPI DSI. HDMI and MIPI can work at the same time. As for HDMI, the maximum resolution is 4k@60Hz. Any HDMI monitor should work as a display for the ROCK 3A.

HDMI port supports Consumer Electronics Control (CEC) function. Using ROCK 3A connected to a TV that supports CEC, you can use the command line cec-client application to control the inputs and the TV itself.

The HDMI interface pin specification shows below.

Pin#	Name

1	HDMI_TX2P
2	GND
3	HDMI_TX2N
4	HDMI_TX1P
5	GND
6	HDMI_TX1N
7	HDMI_TX0P
8	GND
9	HDMI_TX0N
10	HDMI_TXCP
11	GND
12	HDMI_TXCN
13	HDMI_CEC
14	NC

15	DDC_SCL
16	DDC_SDA
17	GND
18	VCC5V0_HDMI
19	PORT_HPD

10.MIPI Camera Interface

There is a wide range of camera applications in our lives. MIPI CSI 2 lane on board support 800 MP camera via FPC connector.

The MIPI CSI interface pin specification shows below.

Pin#	Name
1	VCC_CAM
2	I2C4_SDA
3	I2C4_SCL
4	CAM_MCLK
5	CAM_GPIO1
6	GND

7	MIPI_RX0_CLKP
8	MIPI_RX0_CLKN
9	GND
10	MIPI_RX0_D1P
11	MIPI_RX0_D1N
12	GND
13	MIPI_RX0_D0P
14	MIPI_RX0_D0P
15	GND

11.Audio: 3.5mm jack with MIC

Audio can be played through speaker or headphones using a standard 3.5mm jack with MIC.

Note that HD codec supports up to 24-bit/96KHz audio.

12.PWM Fan

Definition table (From top to bottom in the picture)

Pin#	Name
1	+5.0V
2	PWM
3	GND

13.1000M Ethernet

ROCK 3A has one 1GbE LAN port.

1GbE LAN port LED status and speed table.

LED	speed
Yellow	1000M
Green	100M

14/15/21.USB

One Type-A USB 3.0 port with OTG switch, the upper one on USB 3.0 port

When the USB OTG Switch is switched to the **host** side, the Type-A USB 3.0 port also enables the attachment of peripherals such U Disk, keyboards, mice, USB dongle etc.

This USB 3.0 port supports On-The-Go(OTG) when the USB OTG Switch is switched to the device side. Thus the Soc is recognized as an device.

Take adb as an example. You can use a Type-A to Type-A cable as a bridge between you PC and ROCK 3A Board. In addition to the system configuration, you can setup the adb tool on your PC to access ROCK 3A over adb.

One Type-A USB 3.0 host port

Tthe Type-A USB 3.0 port enables the attachment of peripherals such U Disk, keyboards, mice, USB dongle etc.

Two Type-A USB 2.0 host port

These two ports enables the attachment of peripherals such U Disk, keyboards, mice, USB dongle etc.

One USB 2.0 signal on 40-pin header

According to the ROCK 3A SKU table, there are two USB 2.0 signal lines on 40-pin header, PIN 27&28.

When you want to select this USB function, you need to modify the hardware like this.

- Remove R90526 R90527
- Add R90536 R90537

16.PoE

ROCK Pi 23W PoE HAT could power on ROCK 3A.

17.SoC

SoC is RK3568.

18: MASKROM MODE

This is the 2-pin definition table.

Pin#	Name
1	EMMC_CLKOUT
2	GND

Short-circuit the EMMC_CLKOUT pin and GND pin to make eMMC unavailable.

One of the following behavior would boot ROCK 3A into MASKROM mode.

- Remove SD card + remove eMMC + remove SPI Nor Flash on board
- Remove SD card + remove eMMC + SPI Nor Flash is on board + short-circuit the FSPI_CLK pin and GND pin
- Remove SD card + insert eMMC + short-circuit the EMMC_CLKOUT pin and GND pin + SPI Nor Flash is on board + short-circuit the FSPI_CLK pin and GND pin

19.DDR: LPDDR4

20.General purpose input-output (GPIO) connector

ROCK 3A has one 40-pin expansion header. Each pin is distinguished by color.

For more details, see the ROCK 3A GPIO page.

Please note that do not touch the metal pins directly with your hands.

22.RTC

The RTC connector is designed according to the standard connector type.

You can distinguish '+3.3V' and '-' from the silk screen on the board.

Pin#	Name
1	GND
2	+3.3V

23.PCIE M.2 NGFF M-KEY SOCKET Interface

On ROCK 3A board, M.2 connector supports up to 2T M2 NVME SSD.

The PCIE M.2 interface pin specification shows below.

Name	Pin#	Pin#	Name
GND	1	2	+3.3V
GND	3	4	+3.3V
PERn3	5	6	NC

PERp3	7	8	NC
GND	9	10	DAS/DSS#
PETn3	11	12	+3.3V
PETp3	13	14	+3.3V
GND	15	16	+3.3V
PERn2	17	18	+3.3V
PERp2	19	20	EMMC_CMD
GND	21	22	NC
PETn2	23	24	NC
PETp2	25	26	NC
GND	27	28	NC
PERn1	29	30	NC
PERp1	31	32	NC
GND	33	34	NC

PETn1	35	36	NC
PETp1	37	38	DEVSLP
GND	39	40	NC
PERn0/SATA-B+	41	42	NC
PERp0/SATA-B-	43	44	NC
GND	45	46	NC
PETn0/SATA-A-	47	48	NC
PETp0/SATA-A+	49	50	PERST#
GND	51	52	CLKREQ#
REFCLKN	53	54	PEWake#
REFCLKP	55	56	NC
GND	57	58	NC
NC	67	68	SUSCLK
PEDET	69	70	+3.3V

GND	71	72	+3.3V
GND	73	74	+3.3V
GND	75		

24.TF Card Interface

The TF card can be used as a system storage or an external storage. When it's used as a system storage, you had better choose the ones with storage space larger than 8GB. When it's used as an external storage, you can choose the ones with storage space up to 128GB. When the TF card is inserted into the TF card slot , the device will be automatically recognized by the system.

The TF card interface pin specification shows below.

Pin#	Name
1	SDMMC0_D2
2	SDMMC0_D3
3	SDMMC0_CMD
4	VCC3V3_SYS
5	SDMMC0_CLK
6	GND
7	SDMMC0_D0

8	SDMMC0_D1
9	SDMMC0_DET_L
10	GND
11	GND
12	GND
13	GND

25.SPI Nor Flash

26. eMMC

Socket on Board Interface Feature

The high performance eMMC module is the best choice as the system storage for ROCK 3A. The eMMC module with 8GB/16GB/32GB/64GB/128GB is available.

The eMMC Socket pin specification shows below.

Name	Pin#	Pin#	Name
GND	1	34	GND
EMMC_D5	2	33	EMMC_D6
GND	3	32	GND
EMMC_D4	4	31	EMMC_D7

GND	5	30	GND
EMMC_D0	6	29	EMMC_D1
GND	7	28	GND
EMMC_CLK	8	27	EMMC_D2
GND	9	26	GND
EMMC_D3	10	25	EMMC_CMD
GND	11	24	GND
EMMC_RSTN	12	23	VCC3V3_SYS
GND	13	22	VCC3V3_SYS
GND	14	21	VCC_1V8
EMMC_RCLK	15	20	VCC_1V8
GND	16	19	GND
GND	17	18	GND