Toybrick TB-RK3399ProD Specification

V1.0

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1 Overview

1.1 TB-RK3399ProD introduction

Toybrick RK3399Pro development board is aimed at the chip development of Rockchip RK3399Pro, which integrates reference design, chip debugging and testing, and chip verification. It is used to display the powerful multimedia interface and rich peripheral interface of Rockchip RK3399Pro, and provide a hardware reference design based on the Rockchip RK3399Pro, which enables the developer to complete the hardware development of the AI product without modifying or simply modifying the module circuit of the reference design.

The Toybrick RK3399Pro development board supports SDK development, application software development and operation of the RK3399Pro. With the complete interface and strong extension, it can be applied to different application scenarios and full-featured verification.

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1.2 RK3399Pro block diagram

The RK3399Pro is one of the high-end chips of Rockchip, a high-performance application processor for high-end tablets, notebooks, and smart monitors, and is one of the powerful solutions for 4Kx2K TV boxes. In the field of AI, RK3399Pro has realized multi-domain, multi-industry, multi-scenes commercial use, including smart home, AI smart sweeping robot, IoT AI speaker, OTT and so on.

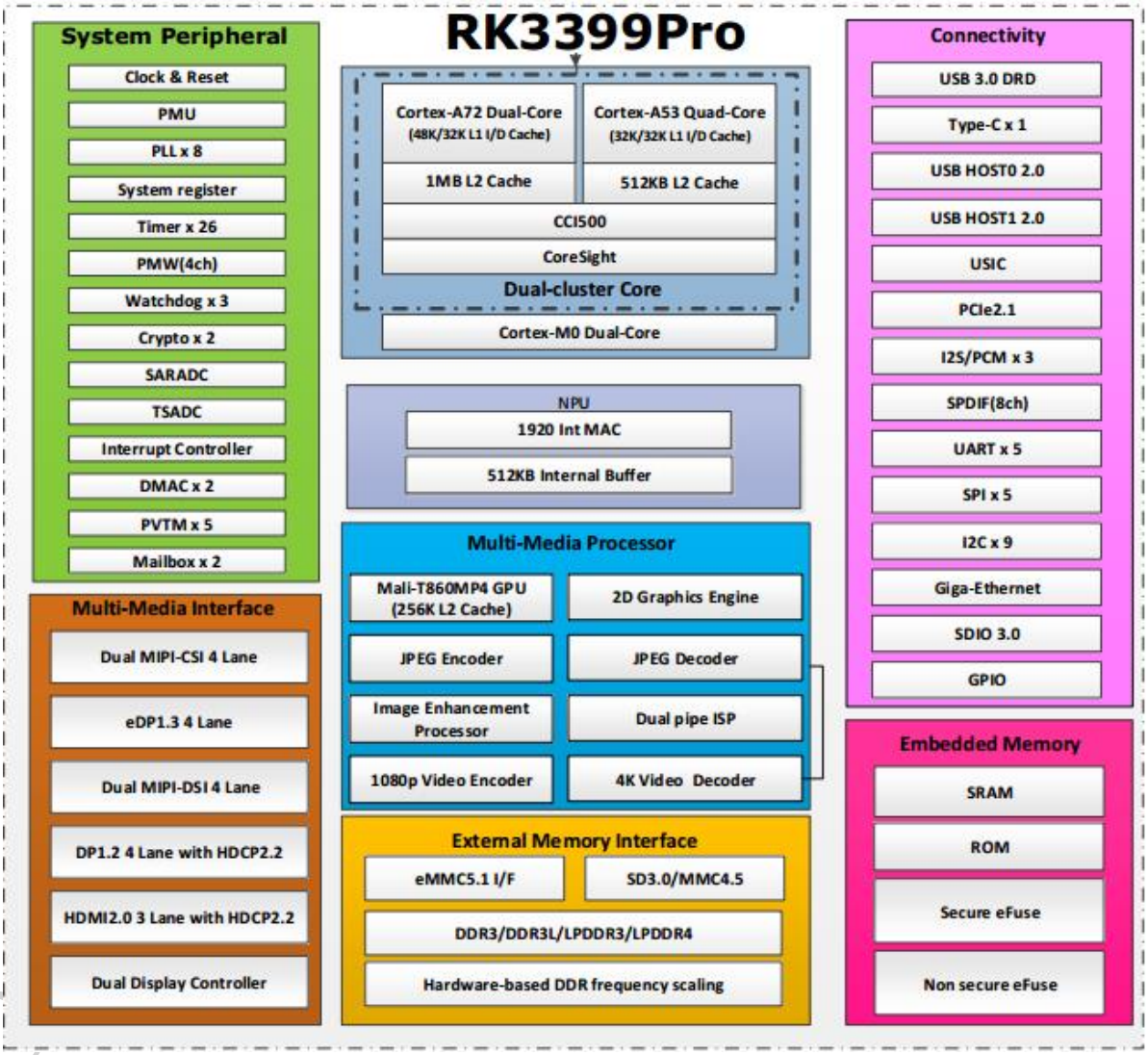

Fig 1-1 block diagram

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1.1 System block diagram

Toybrick RK3399Pro development board uses RK3399Pro as the main chip, and the power system uses PMIC RK809-3, which is composed of peripheral buck and LDO. The use of LPDDR3, eMMC and related functional peripherals constitutes a stable mass production solution.

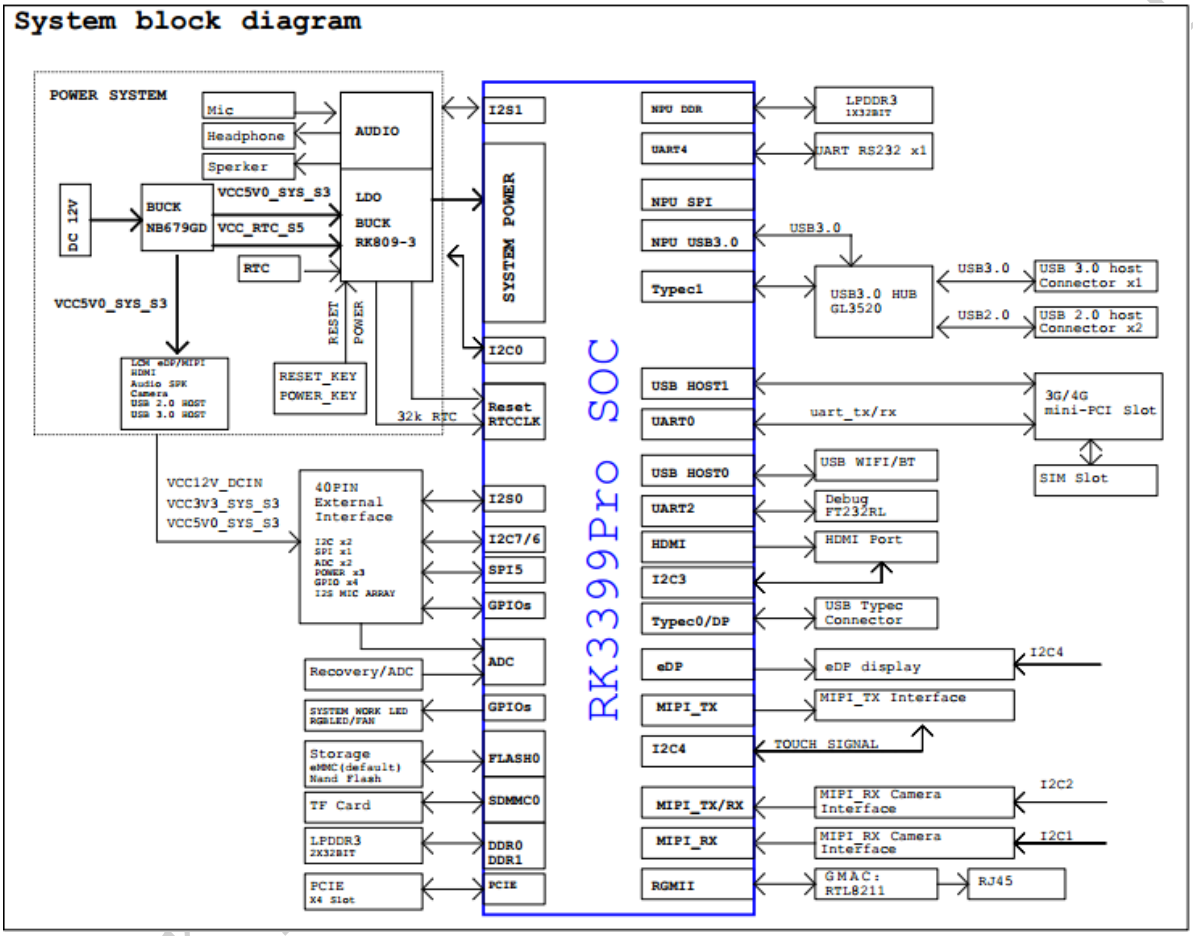

Fig 1-2 System block diagram

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1.1 Specification

Table 1-1 Specification

Interface Specification	
SOC	RK3399Pro
CPU	Big.Little architecture: Dual Cortex-A72 + Quad Cortex-A53, 64-bit CPU Frequency is up to 1.8GHz
GPU	Mali-T860MP4 GPU, OpenGL ES1.1/2.0/3.0/3.1, OpenVG1.1, OpenCL, DX11 Supports AFBC (ARM Frame Buffer Compression)
NPU	Support 8-bit/16-bit Inference Support TensorFlow、TensorFlow lite、Pytorch、Caffe、Mxnet、Darknet、Onnx Model
VPU	4K VP9 and 4K 10bits H265/H264 video decoders, up to 60fps 1080P other video decoders (VC-1, MPEG-1/2/4, VP8) 1080P video encoders for H.264 and VP8 Video post processor: de-interlace, de-noise, enhancement for edge/detail/color
RGA	Support real-time image scaling, cropping, format conversion, rotation and other functions
Storage	3GB/6GB LPDDR3
eMMC	16GB/32GB eMMC
Display	HDMI2.0(Type-A) for 4K/60fps with HDCP1.4/2.2 DisplayPort 1.2(Type-A), up to 4K@60fps MIPI interface, support 1920*1080@60fps eDP1.3, support 2K@60fps
Audio	Support microphone，headphone，speaker 8 channels I2S supports 8 channels array microphone

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Wireless Network	Support 2.4G WiFi，support 802.11b/g/n potocol Support Bluetooth4.2
Ethernet	10/100/1000Mbps Ethernet (Realtek RTL8211E)
Camera interface	Support dual channel MIPI-CSI camera interface,（Maximum 13Mpixel or dual 8Mpixel）
USB	2*USB2.0 Host(Type-A) 1*USB3.0 Host(Type-A) 1*USB3.0 OTG(Type-C)
PCIE	1*mini PCIe interface for LTE module 1*PCIe x4 interface support the expansion of high-speed WIFI, storage and other devices based on PICe
SIM	1*SIM connector for extending LTE module with mini PCIe interface
Key	1* Reset key 1* Power key 1* Recovery key 1* Maskrom key
Debug	1* debug serial port（Micro USB interface）
IO interface	40pin IO interface： 8 channels I2S supports 8 channels array microphone 1*SPI interface 2*ADC interface 2*I2C interface 4*GPIO interface，support interrupt programming DC Power（12V、3.3V、5V）
Power	DC 12V/2A
System	Pre-installed Android and Linux system, support dual system boot and one-button OS switching
PCB size	145mm×106mm

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2 Hardware introduction

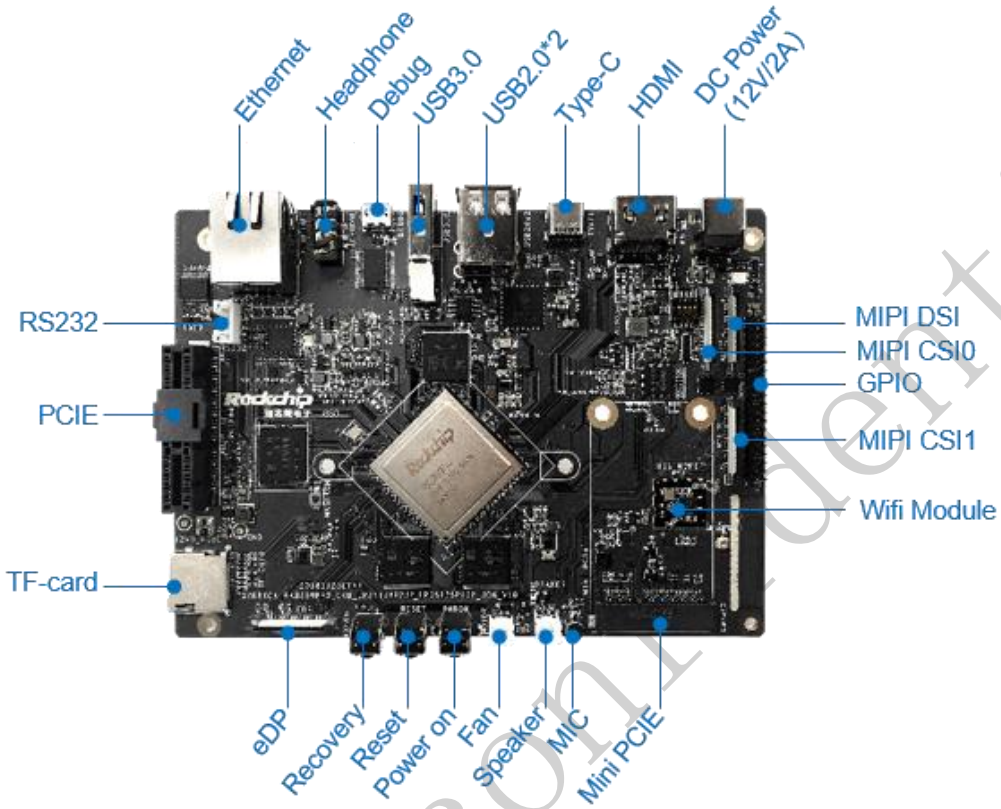

Fig 2-1 Top Layer interface

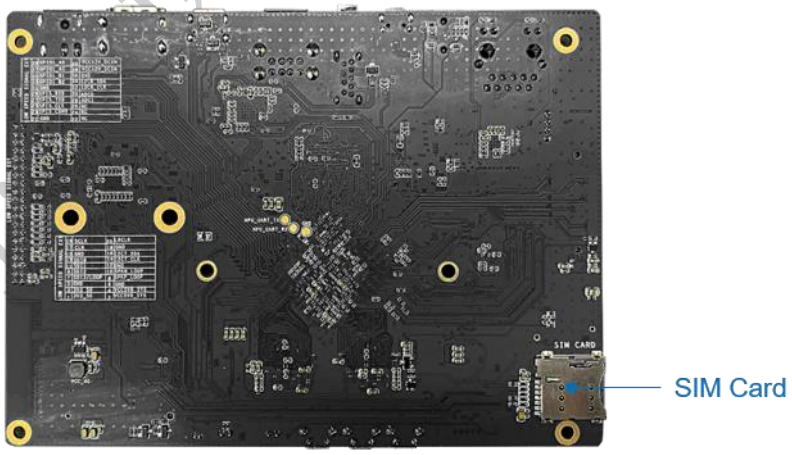

Fig 2-2 Bottom Layer interface

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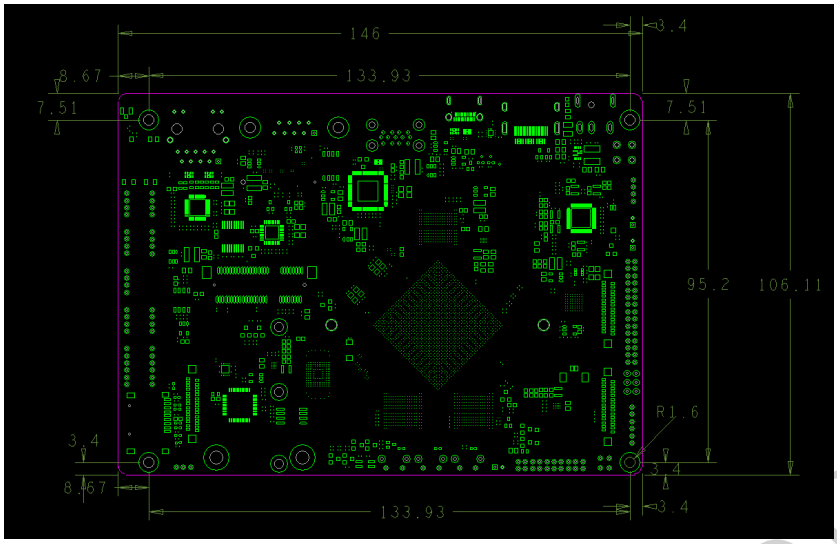

Fig 2-3 PCB size

2.1 Debug interface

Toybrick RK3399Pro development board provides a debug serial port for development and debugging. Debug serial port to connect the main control UART2 interface, connect the FT232RL UART to USB interface conversion chip, and connect with MicroUSB carrier. Users only need a normal MicroUSB cable.

Note： RK3399Rro debug serial port baud rate is 1500000.

Fig 2-4 USB Uart Debug interface

2.1 Power module

The power module of the Toybrick RK3399Pro development board uses the PMIC RK809-3 as the core chip, which is combined with the peripheral Buck and LDO.

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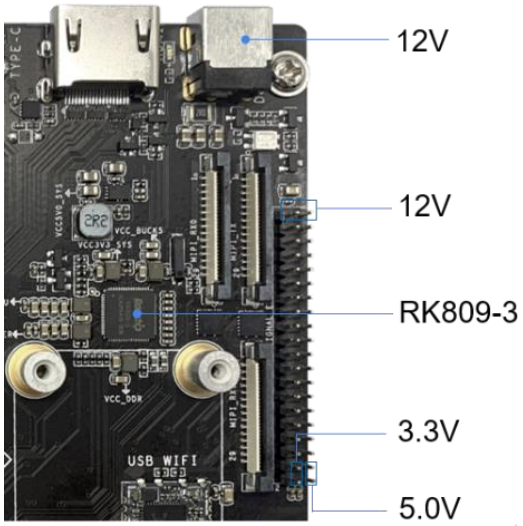

Fig 2-5 Power interface

2.1 Storage module

2.2 Memory

The Toybrick RK3399Pro development board uses two 32bit 2GB/4GB LPDDR3 for CPU, one 32bit 1GB/2GB LPDDR3 for NPU.

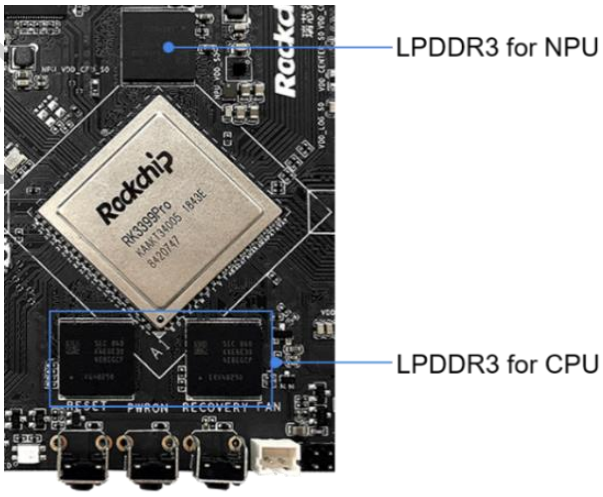

Fig 2-6 LPDDR3

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2.2.1 EMMC

The Toybrick RK3399Pro development board uses eMMC as the system disk ,16GB/32GB is optional.

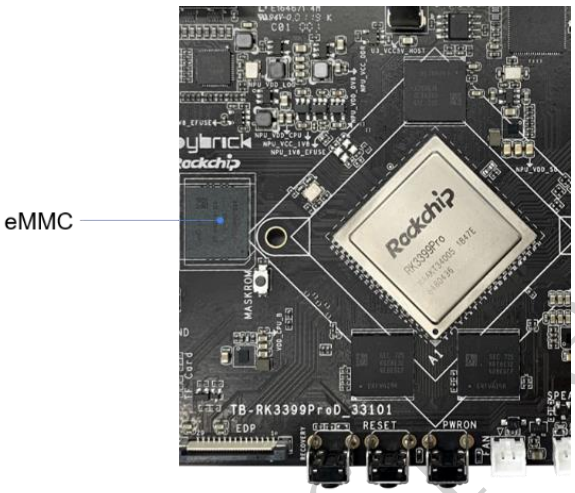

Fig 2-7 eMMC

2.2.2 TF Card

The Toybrick RK3399Pro development board with a TF Card interface that connects to the RK3399Pro SDMMC. The data bus has a broadband of 4 bits, supports hot swapping, and has unlimited capacity.

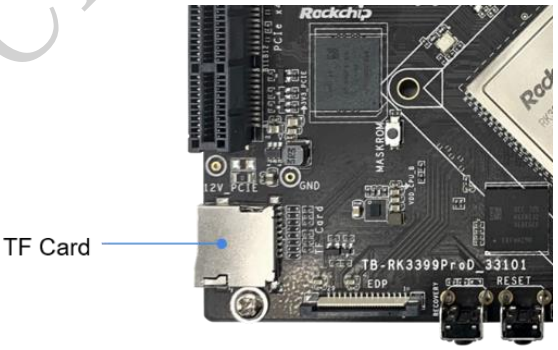

Fig 2-8 TF Card

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2.1 Display module

2.1.1 eDP display

Toybrick RK3399Pro development board support 2K eDP display.

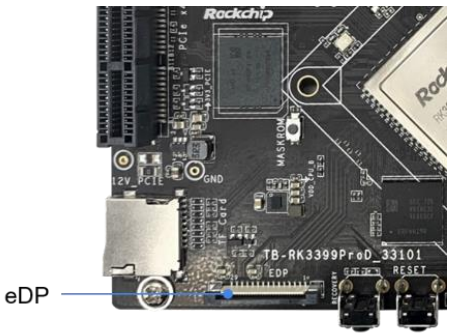

Fig 2-9 Edp display interface

eDP pin definition is shown in the following table:

Table 2-1 eDP pin definition

pin	name
1	GND
2	EDP_TX0N
3	EDP_TX0P
4	GND
5	EDP_TX1N
6	EDP_TX1P
7	GND
8	EDP_AUXN
9	EDP_AUXP
10	GND
11	EDP_TX2N
12	EDP_TX2P
13	GND
14	EDP_TX3N
15	EDP_TX3P

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16	GND
17	LCD_BL_PWM
18	GND
19	VCC3V3_S0
20	LCD_RST_H
21	NC
22	LCD_BL_EN_H
23	I2C_SCL_TP
24	I2C_SDA_TP
25	TOUCH_INT_L
26	TOUCH_RST_L
27	GND
28	VCC5V0_SYS
29	VCC5V0_SYS
30	VCC5V0_SYS

2.1.1 MIPI display

Toybrick RK3399Pro development board support 5.5 inch 720P Mipi panel.

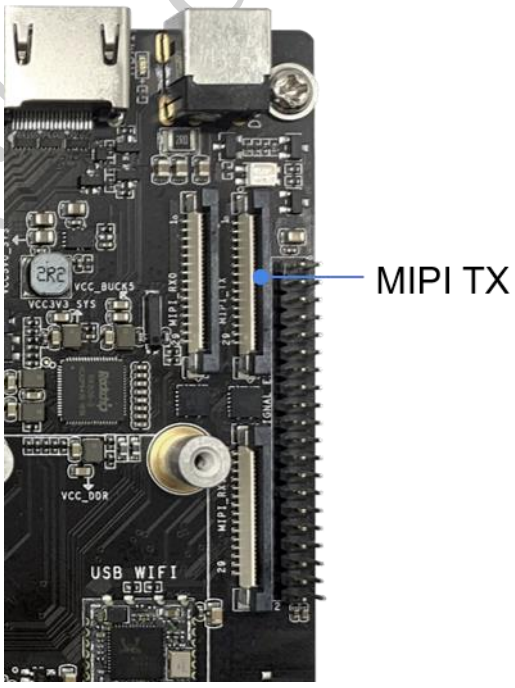

Table 2-10 MIPI display interface

Mipi pin definition is shown in the following table:

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Table 2-2 MIPI_TX pin definition

pin	name
1	GND
2	MIPI_TX0_D0N
3	MIPI_TX0_D0P
4	GND
5	MIPI_TX0_D1N
6	MIPI_TX0_D1P
7	GND
8	MIPI_TX0_CLKN
9	MIPI_TX0_CLKP
10	GND
11	MIPI_TX0_D2P
12	MIPI_TX0_D2N
13	GND
14	MIPI_TX0_D3N
15	MIPI_TX0_D3P
16	GND
17	LCD_BL_PWM
18	NC
19	NC
20	LCD_RST_H
21	GND
22	LCD_EN_H
23	I2C_SCL_TP
24	I2C_SDA_TP
25	TOUCH_INT_L
26	TOUCH_RST_L
27	GND
28	VCC5V0_SYS
29	VCC5V0_SYS
30	VCC5V0_SYS

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2.1.1 HDMI display

The Toybrick RK3399Pro development board supports HDMI display, adopts A-type interface, and can form dual-screen display with other display interfaces: dual-screen display and dual screen different display.

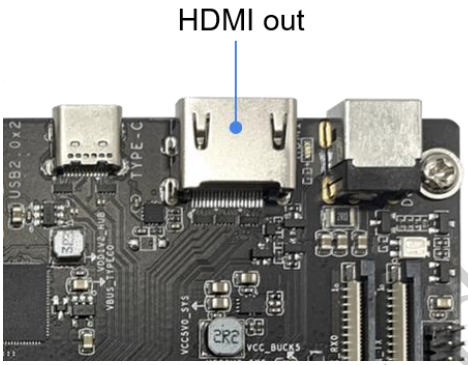

Fig 2-11 HDMI interface

2.1.2 MIPI Camera

The Toybrick RK3399Pro development board has 2 channels of Mipi Camera interface, which can be connected with 2 cameras to form dual MIPI Camera synchronous display and front and rear camera mode. It can also connect 1 channel IMX258 to achieve 4K HD camera.

The two Mipi interface on the development board is compatible. Users only need to design a simple power conversion circuit to match other Camera modules.

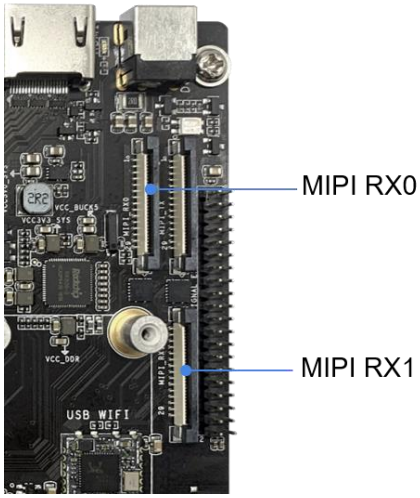

Fig 2-12 Mipi Camera interface

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Table 2-3 MIPI Rx pin definition

Pin	Name	Pin	Name
1	GND	16	GND
2	MIPI_TX0_D0N	17	LCD_BL_PWM
3	MIPI_TX0_D0P	18	NC
4	GND	19	VCC_3V3
5	MIPI_TX0_D1N	20	NC
6	MIPI_TX0_D1P	21	NC
7	GND	22	LCD_EN_H
8	MIPI_TX0_CLKN	23	I2C_SCL_TP
9	MIPI_TX0_CLKP	24	I2C_SDA_TP
10	GND	25	TOUCH_INT_L
11	MIPI_TX0_D2P	26	TOUCH_RST_L
12	MIPI_TX0_D2N	27	GND
13	GND	28	VCC5V0_SYS
14	MIPI_TX0_D3N	29	VCC5V0_SYS
15	MIPI_TX0_D3P	30	VCC5V0_SYS

2.1 Audio module

The Toybrick RK3399Pro development board supports microphone input, speaker output and headphone output.

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Fig 2-13 Audio interface

2.1 USB module

2.1.1 USB Host

The Toybrick RK3399Pro development board integrates two USB2.0 Host and one USB3.0 Host. A variety of man-machine interaction methods such as an external USB mouse, keyboard and USB disk.

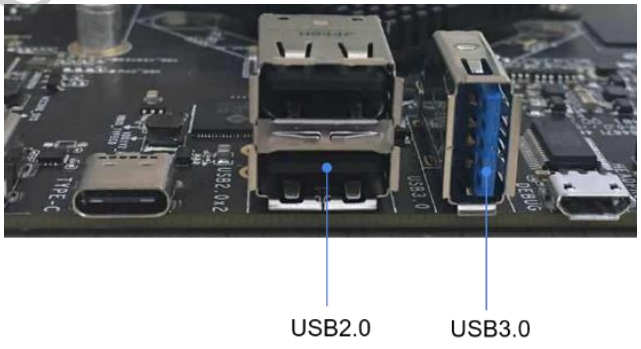

Fig 2-14 USB interface

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2.1.2 Type-C

The Toybrick RK3399Pro development board integrates a Type-C interface and supports USB OTG functionality. Can be used as android adb device; when connected to a variety of human-machine interaction modes such as USB mouse, keyboard and U disk, automatically switch to Host mode.

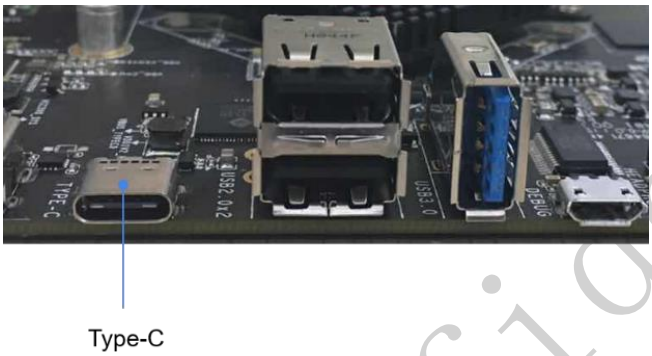

Fig 2-15 Type-C interface

2.1 PCI-E interface

2.1.1 Mini PCI-E

Toybrick RK3399Pro development board intergrated Mini PCIE-E interface, External 4G module and SIM card can be connected to realize 4G communication.

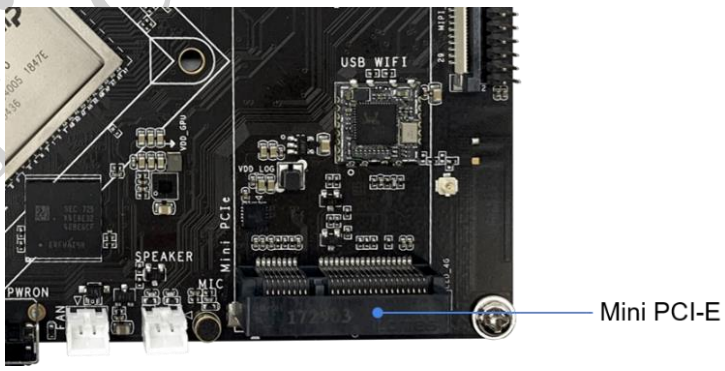

Fig 2-16 Mini PCI-E interface

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2.1.2 PCI-E

Toybrick RK3399Pro development board integrates PCI-E x 4 interfaces and supports expansion highspeed WIFI, storage and other devices based on Pcie.

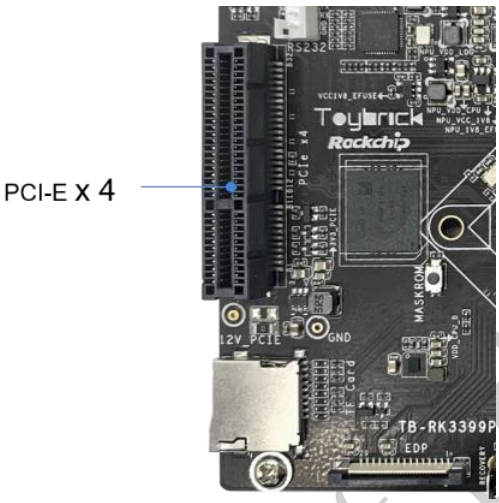

Fig 2-17 PCI-E interface

2.1 Low speed IO interface

40Pin low speed IO interface pin definition is shown in the following table:

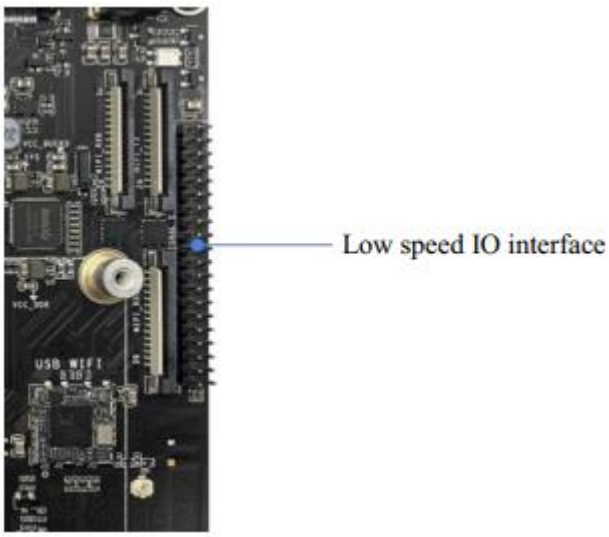

Fig 2-18 Low speed IO interface

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Table 2-4 Low speed IO interface pin definition

Pin	Name	Pin	Name
1	3V3_SO	21	GND
2	VCC5V0_SYS	22	NC
3	3V3_SO	23	SPI5_CSN0
4	VCC5V0_SYS	24	GPIO1_A5
5	GND	25	SPI5_CLK
6	GND	26	GPIO1_A6
7	SDI3/LOOP	26	SPI5_TXD
8	SPKP_LOOP	28	ADC1
9	SDI2	29	SPI5_RXD
10	SPKN_LOOP	30	ADC0
11	SDI1	31	GND
12	GND	32	I2C6_CLK
13	SDI0	33	GPIO1_B2
14	I2C7_CLK	34	I2C6_SDA
15	GND	35	GPIO1_B1
16	I2C7_SDA	36	GND
17	CLK	37	NC
18	GND	38	NC
19	SCLK	39	12V_DCIN
20	LRCLK	40	12V_DCIN

2.1 Network communication

2.1.1 Ethernet

The Toybrick RK3399Pro development board integrates the RJ45 Gigabit Ethernet interface with the following features:

- Compatible with IEEE802.3 standard, supports full-duplex and half-duplex operation,supports cross-detection and self-adaptation.
- Supports 10/100/1000M data rate.
- The interface uses an RJ45 interface with an indicator light and an isolation

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transformer.

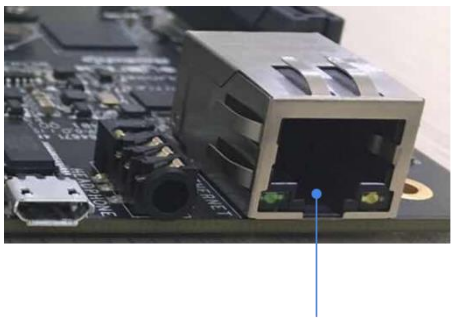

Fig 2-19 RJ45 interface

2.1.2 WIFI/BT

Toybrick RK3399Pro development board integrates USB WIFI/BT modules with the following features:

- Support WIFI 2.4G and BT4.2.

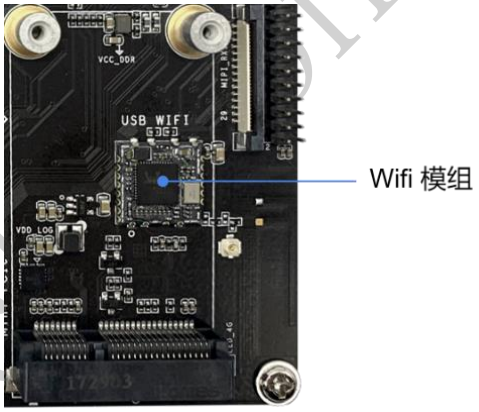

Fig 2-20 WIFI module

2.2 UART interface

2.2.1 RS232 interface

TB-RK3399Pro development board integrates 1 channel RS232 interface, supports duplex communication, and supports software standard UART programming.

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