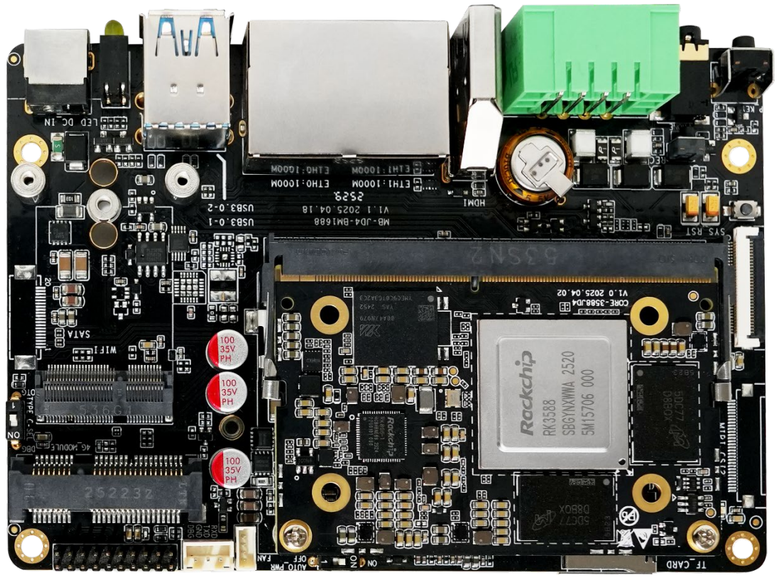
AIO-3588JD4

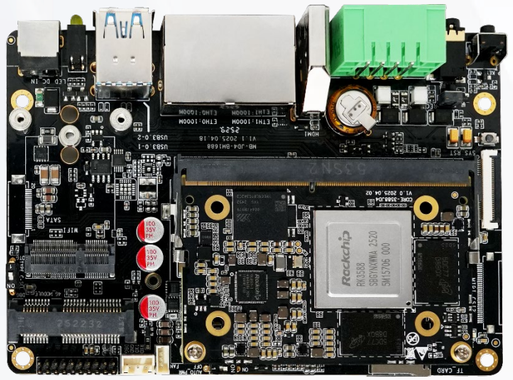
AI Large-model Mainboard



V1.0 2026-1-28

FIREFLY TECHNOLOGY

Product features



A new generation of flagship AIoT chip RK3588

Adopting Rockchip's new flagship AIoT chip RK3588, 8nm LP process. It is equipped with an octa-core 64-bit CPU with a frequency of up to 2.4GHz.

8K HD video decoding and encoding

Supports 8K@60fps H.265/VP9, 8K@30fps H.264 video decoding, and 8K@30fps H.265/H.264 video encoding. Support the same compilation and interpretation.

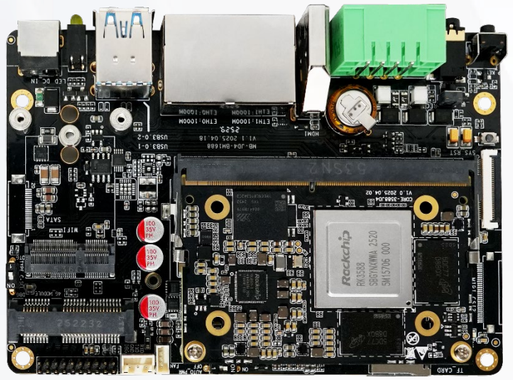
6TOPS powerful computing power NPU

The computing power can reach 6TOPS, support INT4/INT8/INT16 hybrid computing, and can carry out more intelligent data processing, speech recognition, image analysis to meet the AI application requirements of most terminal devices for edge computing.

The private deployment of large language models

Support the private deployment of ultra-large-scale parameter models under the Transformer architecture, including large language models such as Gemma-2B, ChatGLM3-6B, Qwen-1.8B, Phi-3-3.8B. Support Docker container management technology.

Product features



Multiple deep learning frameworks

It supports traditional network architectures such as CNN, RNN, and LSTM, and supports the import and export of RKNN models; Support a variety of deep learning frameworks, including TensorFlow, TensorFlow Lite, PyTorch, Caffe, ONNX and Darknet. It also supports the development of custom operators.

Various operating systems

Support Android and Linux OS, domestic operating system, and can support UEFI boot; Provide a safe and stable system environment for product research and production to meet the needs of different users.

Abundant expansion interfaces

Equipped with MIPI-CSI, HDMI2.1, M.2, USB3.0, USB2.0, Type-C, RS485, RS232, CAN, SPI, I2C and other expansion interfaces, convenient for connecting various external devices.

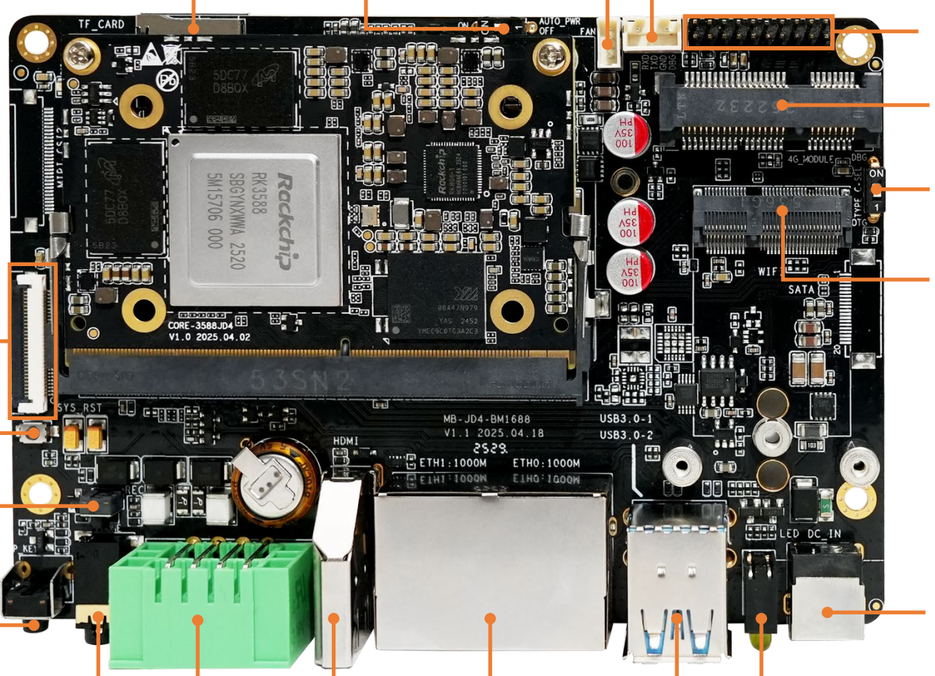
A wide range of applications

It is widely used in: ARM PC, edge computing, cloud terminals, cloud servers, industrial control, artificial intelligence, large model privatization deployment, intelligent security and other fields.

Specifications

Specifications		
Basic Specifications	SOC	Rockchip RK3588
	CPU	Octa-core 64-bit processor (4×Cortex-A76+4×Cortex-A55) , main frequency up to 2.4GHz
	GPU	ARM Mali-G610 MP4 quad-core GPU, support OpenGL ES3.2/OpenCL 2.2/Vulkan1.1, 450 GFLOPS
	NPU	The computing power is up to 6TOPS(INT8), support INT4/INT8/INT16 mixed operations
	ISP	Integrated 48MP ISP, support HDR and 3DNR
	Codecs	Hard Decoding: 8K@60fps H.265/VP9/AVS2, 8K@30fps H.264 AVC/MVC, 4K@60fps AV1, 1080P@60fps MPEG-2/-1/VC-1/VP8 Hard Encoding: 8K@30fps H.265/H.264
	RAM	LPDDR4/LPDDR4x (4GB/8GB/16GB/32GB optional)
	Storage	eMMC (32GB/64GB/128GB/256GB optional)
	Storage expansion	1 × TF Card, 1 × M.2 (Expandable SATA 3.0/PCIe NVMe SSD, supports 2242/2260/2280 specifications)
	Power	DC 12V (5.5mm × 2.1mm, support 9V~24V wide voltage input)
	Power consumption	Max: 14.4W(12V/1200mA), Normal: 4.8W(12V/400mA), Min: 0.636W(12V/53mA)
	OS	Android, Linux OS
	Software Support	· Support the privatization deployment of ultra-large-scale parametric models under the Transformer architecture, such as Gemma-2B, ChatGLM3-6B, Qwen-1.8B, Phi-3-3.8B and other large language models · It supports traditional network architectures such as CNN, RNN, and LSTM, and supports the import and export of RKNN models; Support a variety of deep learning frameworks, including TensorFlow, TensorFlow Lite, PyTorch, Caffe, ONNX and Darknet. It also supports the development of custom operators · Support Docker container management technology
	Size	122.89mm × 85.04mm × 22.46mm
	Weight	≈120g
	Environment	Operating Temperature: -20℃ ~ 60℃, Storage Temperature: -20℃ ~ 70℃, Storage Humidity: 10% ~ 90%RH (non-condensing)
Interface Specifications	Internet	Ethernet: 2 × RJ45 (1000Mbps) WiFi: Extend WiFi/Bluetooth module through M.2 E-KEY (2230), support 2.4GHz/5GHz dual band WiFi6 (802.11a/b/g/n/ac/ax), Bluetooth5.2 4G: Extend 4G LTE via Mini PCIe (Shared with 5G) 5G: Extend 5G via M.2 B-KEY (Shared with 4G and USB3.0(1), not populated by default)
	Video input	2 × MIPI CSI DPHY (1×4lanes/2×2lanes, 30Pin-0.5mm), Line in (Led by double row headers)
	Video output	1 × HDMI2.1 (8K@60Hz/4K@120Hz)
	Audio output	1 × 3.5mm Audio jack (Support MIC recording, American Standard CTIA)
	USB	2 × USB3.0 (Max: 1A; Upper: USB3.0(1), shared with 5G; Lower: USB3.0(2)), 1 × Type-C (OTG)
	Watchdog	Independent watchdog
	Other interfaces	1 × FAN (4Pin-1.25mm), 1 × SIM Card, 1 × Double-row pin headers (20Pin-2.0mm): USB2.0, SPI, 2×I2C, Line in, Line out, GPIO 1 × Phoenix connector (8Pin-3.5mm): 1 × RS485, 1 × RS232, 1 × CAN 2.0

Interface description



Auto Power-on DIP Switch
(ON: Power on directly when connected;
1: Press Power button briefly to power on after connection)

TF Card

FAN (4Pin-1.25mm)

Debug (3Pin-2.0mm)

Double-row pin headers
(20Pin-2.0mm)

Mini PCIe
(Expand 4G/3G)

Type-C function selection
(ON: Debug; 1: Flash/OTG)

M.2 E-KEY
(Expand WiFi/Bluetooth module)

MIPI CSI DPHY
(1×4 lanes/2×2 lanes, 30Pin-0.5mm)

Reset

MaskRom

Power button

DC 12V
(5.5mm×2.1mm,
support 9V~24V wide voltage input)

3.5mm Audio jack
(Support MIC recording, CTIA)

Phoenix connector
(8Pin-3.5mm)

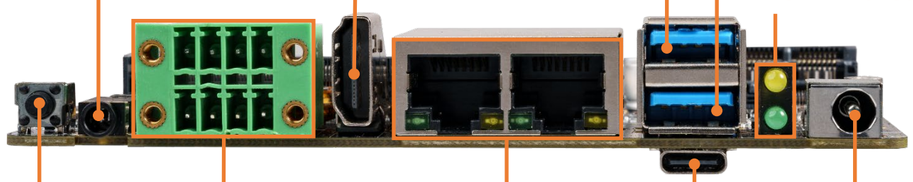
HDMI2.1
(8K@60Hz/4K@120Hz)

2×Gigabit Ethernet
(RJ45/1000Mbps)

2×USB3.0

Work indicator

Interface description



3.5mm Audio jack
(Support MIC recording, CTIA)

HDMI2.1
(8K@60Hz/
4K@120Hz)

USB3.0(1)
(Shared with 5G)

USB3.0(2)
(Max: 1A)

Work indicator

Power button

2×Gigabit Ethernet
(RJ45/1000Mbps)

Type-C
(OTG)

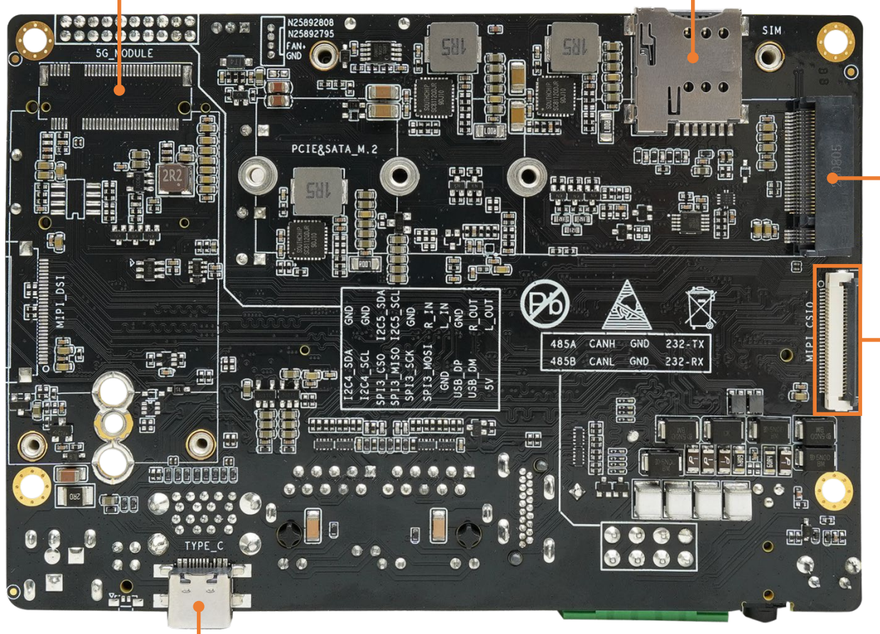
DC 12V
(5.5mm×2.1mm,
support 9V~24V wide
voltage input)

Phoenix connector (8Pin-3.5mm)

232-TX	GND	CANH	485A
232-RX	GND	CANL	485B

M.2 B-KEY
(Expand 5G, not pasted by default,
shared with 4G and USB3.0(1))

SIM Card

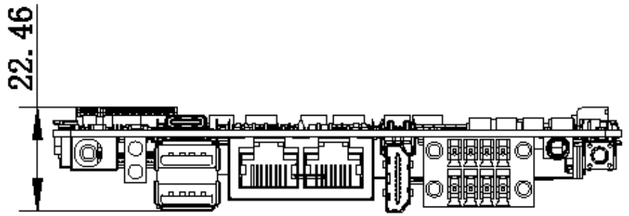


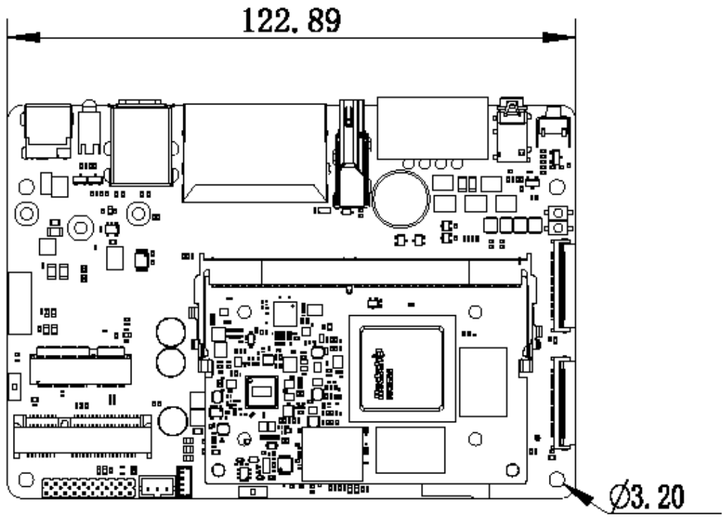
M.2 M-KEY
(SATA3.0/PCIe NVMe SSD
2242/2260/2280)

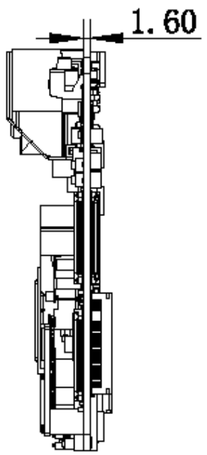
MIPI CSI DPHY
(1×4 lanes/2×2 lanes,
30Pin-0.5mm)

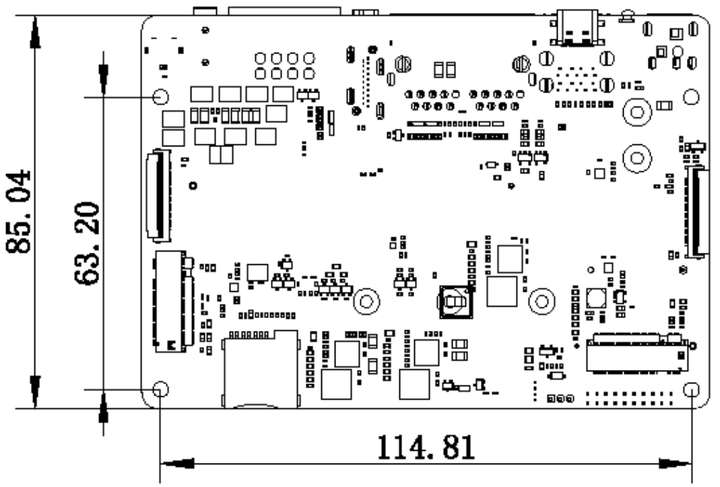
Type-C
(OTG)

Dimension



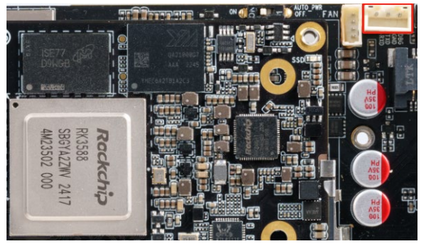






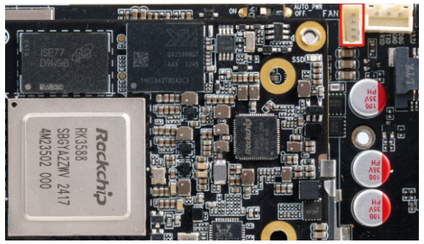
Interface definition

1. (J19) DEBUG: 3PIN 2.0mm Pitch wafer Socket



NO.	Definition	Power/V	NO.	Definition	Power/V
1	UART2_RXD_Debug	3.3	3	GND	
2	UART2_TXD_Debug	3.3			

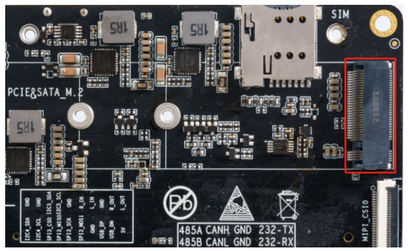
2. (J6) FAN: 4PIN 1.25mm Pitch wafer Socket



NO.	Definition	Power/V	NO.	Definition	Power/V
1	GND		2	FAN+ (5V Output)	5
3	FG Input 【GPIO1_C6_d】	3.3	4	PWM1 Output 【GPIO0_C6_u】	3.3

Interface definition

3. (U4) M.2 PCIE/SATA M-KEY



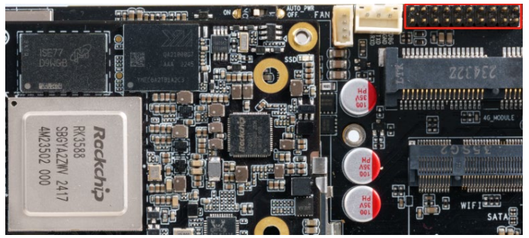
NO.	Definition	Power/V	NO.	Definition	Power/V
1	GND		2	VCC3V3_PCIE (3.3V Output)	3.3
3	GND		4	VCC3V3_PCIE (3.3V Output)	3.3
5	NC		6	NC	
7	NC		8	NC	
9	GND		10	DAS/DSS [pull up resistor10K]	3.3
11	NC		12	VCC3V3_PCIE (3.3V Output)	3.3
13	NC		14	VCC3V3_PCIE (3.3V Output)	3.3
15	NC		16	VCC3V3_PCIE (3.3V Output)	3.3
17	NC		18	VCC3V3_PCIE (3.3V Output)	3.3
19	NC		20	NC	
21	GND		22	NC	
23	NC		24	NC	
25	NC		26	NC	
27	GND		28	NC	
29	NC		30	NC	

Interface definition

31	NC		32	NC	
33	GND		34	NC	
35	NC		36	NC	
37	NC		38	DEVSLP【Expand IO】 [pull up resistor10K]	3.3
39	GND		40	NC	
41	PCIE20_0_RXP/SATA30_0_RXP	-	42	NC	
43	PCIE20_0_RXN/SATA30_0_RXN	-	44	NC	
45	GND		46	NC	
47	PCIE20_0_TXN/SATA30_0_TXN(Series capacitor 100nF)	-	48	NC	
49	PCIE20_0_TXP/SATA30_0_TXP (Series capacitor 100nF)	-	50	PCIE0_RST* (GPIO4_A3_d)	3.3
51	GND		52	PCIE0_CLKREQ* (GPIO3_C7_u)	3.3
53	PCIE20_0_REFCLKN	-	54	PCIE_WAKE*	3.3
55	PCIE20_0_REFCLKP	-	56	NC	
57	GND		58	NC	
67	NC		68	NC	
69	GND		70	VCC3V3_PCIE (3.3V Output)	3.3
71	GND		72	VCC3V3_PCIE (3.3V Output)	3.3
73	GND		74	VCC3V3_PCIE (3.3V Output)	3.3
75	GND				

Interface definition

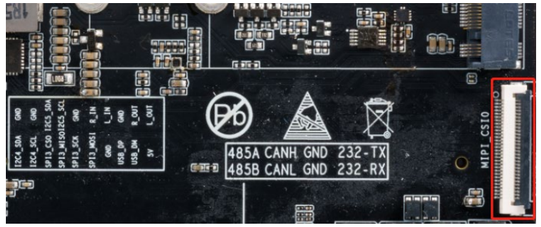
4. (J15) Double-row needles EXTENSION INTERFACE 2*10PIN



NO.	Definition	Power/V	NO.	Definition	Power/V
1	VCC5V0_SYS (5.0V OUTPUT)	5.0 (MAX:500mA)	2	Left output 2 (40mW from ES8388)	3.3
3	USB20_HOST0_DM	-	4	Right output 2 (40mW from ES8388)	3.3
5	USB20_HOST0_DP	-	6	GND	
7	GND		8	Right channel input 1 (to ES8388)	3.3
9	SPI0_MOSI_M3 (GPIO3_D2_d)	1.8	10	Left channel input 1 (to ES8388)	3.3
11	SPI0_CLK_M3 (GPIO3_D3_d)	1.8	12	GND	
13	SPI0_MISO_M3 (GPIO3_D1_d)	1.8	14	I2C4_SCL_M1 (GPIO2_B5_u) (Pull-up resistor 2.2K)	3.3
15	SPI0_CS0_M3 (GPIO3_D4_d)	1.8	16	I2C4_SDA_M1 (GPIO2_B4_u) (Pull-up resistor 2.2K)	3.3
17	I2C3_SCL_M2 (GPIO4_A4_d) (Pull-up resistor 2.2K)	3.3	18	GND	
19	I2C3_SDA_M2 (GPIO4_A5_d) (Pull-up resistor 2.2K)	3.3	20	GND	

Interface definition

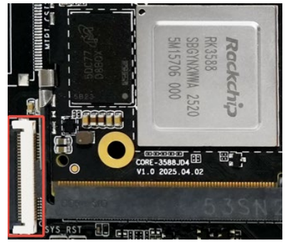
5. (J7) MIPI CSI0 30PIN 0.5mm Pitch



NO.	Definition	Power/V	NO.	Definition	Power/V
1	I2C6_SDA_M0 (GPIO0_D0_d) Pull-up resistor 2.2K	1.8	16	GND	
2	I2C6_SCL_M0 (GPIO0_C7_d) Pull-up resistor 2.2K	1.8	17	MIPI_CSI0_CLK0P	-
3	CAM0_PWDN (GPIO1_A4_d)	1.8	18	MIPI_CSI0_CLK0N	-
4	CAM0_RESET【Expand IO】	1.8	19	GND	
5	GND		20	MIPI_CSI0_D2P	-
6	CAM0_MCLK (GPIO3_A6_d)	1.8	21	MIPI_CSI0_D2N	-
7	CAM3_PWDN【GPIO3_D5_d】	1.8	22	GND	
8	CAM0_RESET【Expand IO】	1.8	23	MIPI_CSI0_D3P	-
9	CAM0_MCLK (GPIO3_A6_d)	1.8	24	MIPI_CSI0_D3N	-
10	GND		25	GND	
11	MIPI_CSI0_D0P	-	26	MIPI_CSI0_CLK1P	-
12	MIPI_CSI0_D0N	-	27	MIPI_CSI0_CLK1N	-
13	GND		28	GND	
14	MIPI_CSI0_D1P	-	29	VCC5V0_SYS (5.0V OUTPUT)	5.0
15	MIPI_CSI0_D1N	-	30	VCC5V0_SYS (5.0V OUTPUT)	5.0

Interface definition

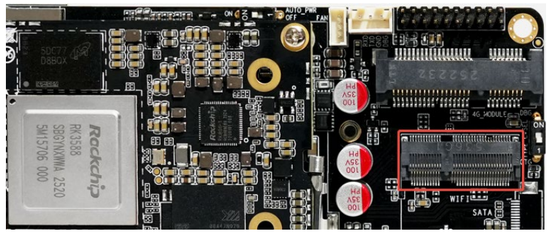
6. (J13) MIPI CSI1 30PIN 0.5mm Pitch



NO.	Definition	Power/V	NO.	Definition	Power/V
1	I2C6_SDA_M0 (GPIO0_D0_d) Pull-up resistor 2.2K	1.8	16	GND	
2	I2C6_SCL_M0 (GPIO0_C7_d) Pull-up resistor 2.2K	1.8	17	MIPI_CSI1_CLK0P	-
3	CAM1_PWDN (GPIO1_A6_d)	1.8	18	MIPI_CSI1_CLK0N	-
4	CAM1_RESET【Expand IO】	1.8	19	GND	
5	GND		20	MIPI_CSI1_D2P	-
6	CAM1_MCLK (GPIO4_B1_u)	1.8	21	MIPI_CSI1_D2N	-
7	CAM4_PWDN 【GPIO1_D5_d】	1.8	22	GND	
8	CAM1_RESET【Expand IO】	1.8	23	MIPI_CSI1_D3P	-
9	CAM1_MCLK (GPIO4_B1_u)	1.8	24	MIPI_CSI1_D3N	-
10	GND		25	GND	
11	MIPI_CSI1_D0P	-	26	MIPI_CSI1_CLK1P	-
12	MIPI_CSI1_D0N	-	27	MIPI_CSI1_CLK1N	-
13	GND		28	GND	
14	MIPI_CSI1_D1P	-	29	VCC5V0_SYS (5.0V OUTPUT)	5.0
15	MIPI_CSI1_D1N	-	30	VCC5V0_SYS (5.0V OUTPUT)	5.0

Interface definition

7. (U16) PCIE WIFI M.2 Module E-KEY



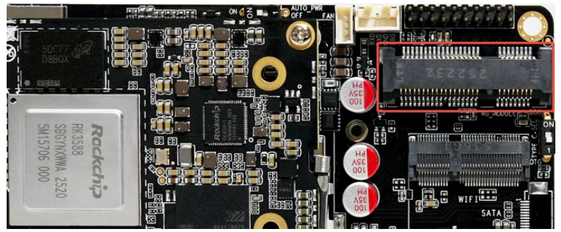
NO.	Definition	Power/V	NO.	Definition	Power/V
1	GND		2	WIFI_3V3 (3.3V Output)	3.3
3	HUB_HOST20_DP3	-	4	WIFI_3V3 (3.3V Output)	3.3
5	HUB_HOST20_DM3	-	6	NC	
7	GND		8	NC	
9	NC		10	NC	
11	NC		12	NC	
13	NC		14	NC	
15	NC		16	NC	
17	NC		18	GND	
19	NC		20	BT_M2_WAKE_AP (GPIO3_C4_u)	3.3
21	NC		22	NC	
23	NC		32	NC	
33	GND		34	NC	
35	PCIE30_PORT0_TX0P (Series capacitor 100nF)	-	36	NC	
37	PCIE30_PORT0_TX0N (Series capacitor 100nF)	-	38	AP_M2_WAKE_BT(Expand IO)	3.3

Interface definition

39	GND		40	NC	
41	PCIE30_PORT0_RX0P	-	42	NC	
43	PCIE30_PORT0_RX0N	-	44	NC	
45	GND		46	NC	
47	PCIE0_CLK_P	-	48	NC	
49	PCIE0_CLK_N	-	50	CLK_32K_OUT (From RTC IC)	1.8
51	GND		52	PCIE1_RST* (GPIO4_B6_d),Active L	3.3
53	PCIE1_CLKREQ* (GPIO4_B4_u)	3.3	54	BT_DISABLE_L (GPIO3_C0_d), Active H	3.3
55	PCIE_WAKE*	3.3	56	WIFI_DISABLE_L (GPIO0_D3_u), Active H	3.3
57	GND		58	NC	
59	NC		60	NC	
61	NC		62	NC	
63	GND		64	NC	
65	NC		66	NC	
67	NC		68	NC	
69	GND		70	NC	
71	NC		72	WIFI_3V3 (3.3V Output)	3.3
73	NC		74	WIFI_3V3 (3.3V Output)	3.3
75	GND				

Interface definition

8. (U21) 4G MINI PCIe



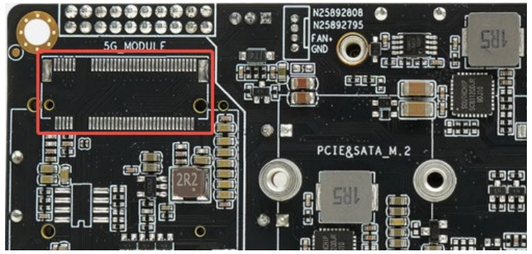
NO.	Definition	Power/V	NO.	Definition	Power/V
1	NC		2	VCC3V8_4G (3.5V Output)	3.5
3	NC		4	GND	
5	NC		6	NC	
7	NC		8	UIM_PWR	1.8
9	GND		10	UIM_DAT	1.8
11	NC		12	UIM_CLK	1.8
13	NC		14	UIM_RST	1.8
15	GND		16	NC	
17	NC		18	GND	
19	NC		20	NC	
21	GND		22	4G_RESET	3.5
23	NC		24	NC	
25	NC		26	GND	
27	GND		28	NC	
29	GND		30	NC	

Interface definition

31	NC		32	NC	
33	NC		34	GND	
35	GND		36	4G_HOST20_DM3	-
37	GND		38	4G_HOST20_DP3	-
39	VCC3V8_4G (3.5V Output)	3.5	40	GND	
41	VCC3V8_4G (3.5V Output)	3.5	42	NC	
43	GND		44	SIM_DET	1.8
45	NC		46	NC	
47	NC		48	NC	
49	GND		50	GND	
51	NC		52	VCC3V8_4G (3.5V Output)	3.5

Interface definition

9. (U26) 5G NGFF-M.2-B-KEY (Defult:NC)



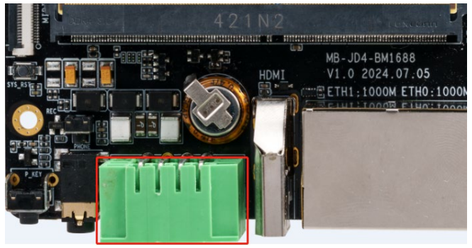
NO.	Definition	Power/V	NO.	Definition	Power/V
1	NC		2	VCC3V8_4G (3.5V Output)	3.5
3	GND		4	VCC3V8_4G (3.5V Output)	3.5
5	GND		6	FUL_CARD_POWER_OFF#	3.5
7	5G_HOST20_DP3	-	8	NC	
9	5G_HOST20_DM3	-	10	NC	
11	GND		20	NC	
21	NC		22	NC	
23	NC		24	NC	
25	NC		26	NC	
27	GND		28	NC	
29	5G_USB30_RX_N	-	30	UIM_RST	1.8
31	5G_USB30_RX_P	-	32	UIM_CLK	1.8
33	GND		34	UIM_DAT	1.8
35	5G_USB30_TX_N (Series capacitor 100nF)	-	36	UIM_PWR	1.8
37	5G_USB30_TX_P (Series capacitor 100nF)	-	38	NC	

Interface definition

39	GND		40	NC	
41	NC		42	NC	
43	NC		44	NC	
45	GND		46	NC	
47	NC		48	NC	
49	NC		50	NC	
51	GND		52	NC	
53	NC		54	NC	
55	NC		56	NC	
57	GND		58	NC	
59	NC		60	NC	
61	NC		62	NC	
63	GND		64	NC	
65	NC		66	SIM_DET	1.8
67	4G_RESET	3.5	68	NC	
69	NC		70	VCC3V8_4G (3.5V Output)	3.5
71	GND		72	VCC3V8_4G (3.5V Output)	3.5
73	GND		74	VCC3V8_4G (3.5V Output)	3.5
75	NC				

Interface definition

10. (J3) RS485/RS232/CAN 2*4PIN 3.5mm Pitch Connector(GREEN)



NO.	Definition	Power/V	NO.	Definition	Power/V
1	RS485_A (UART6)		2	RS485_B (UART6)	5.0
3	CAN_H (CAN1_M1)	-	4	CAN_L CAN1_M1)	-
5	GND		6	GND	
7	RS232_TX (UART1)	-	8	RS232_RX (UART1)	-

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