

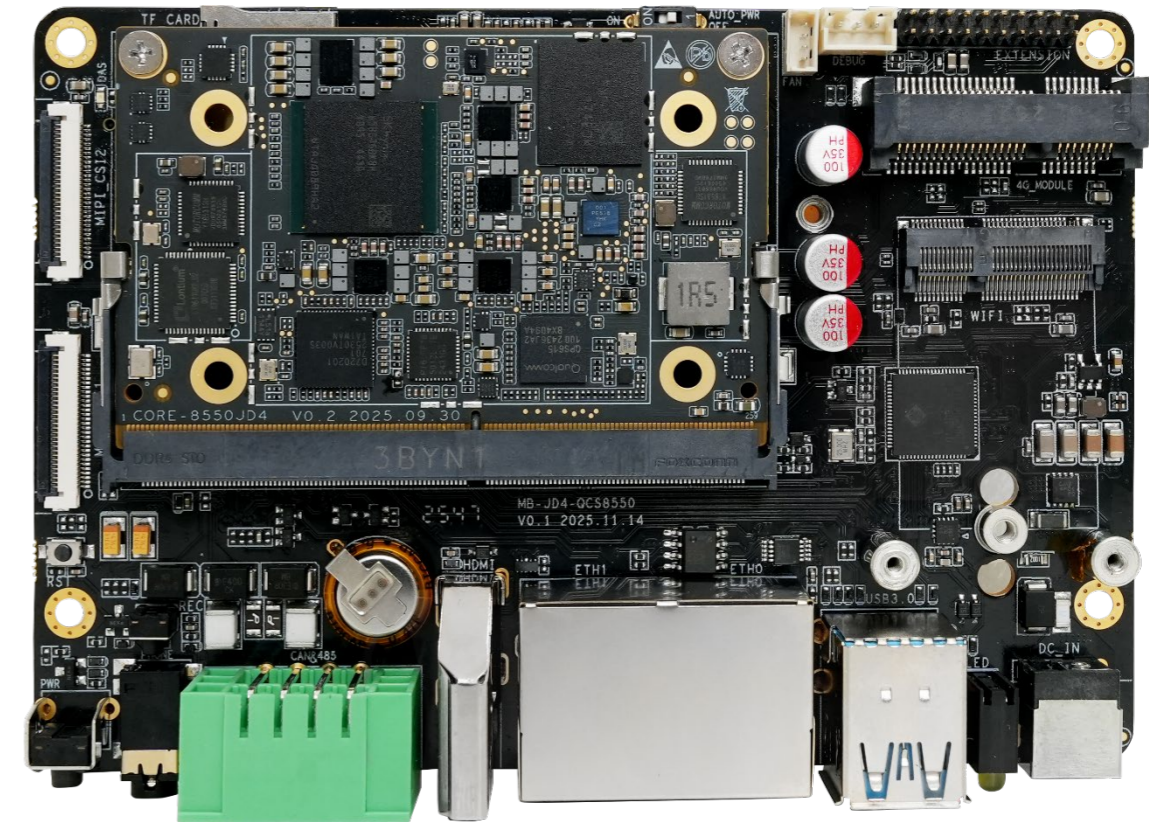


AIO-8550JD4

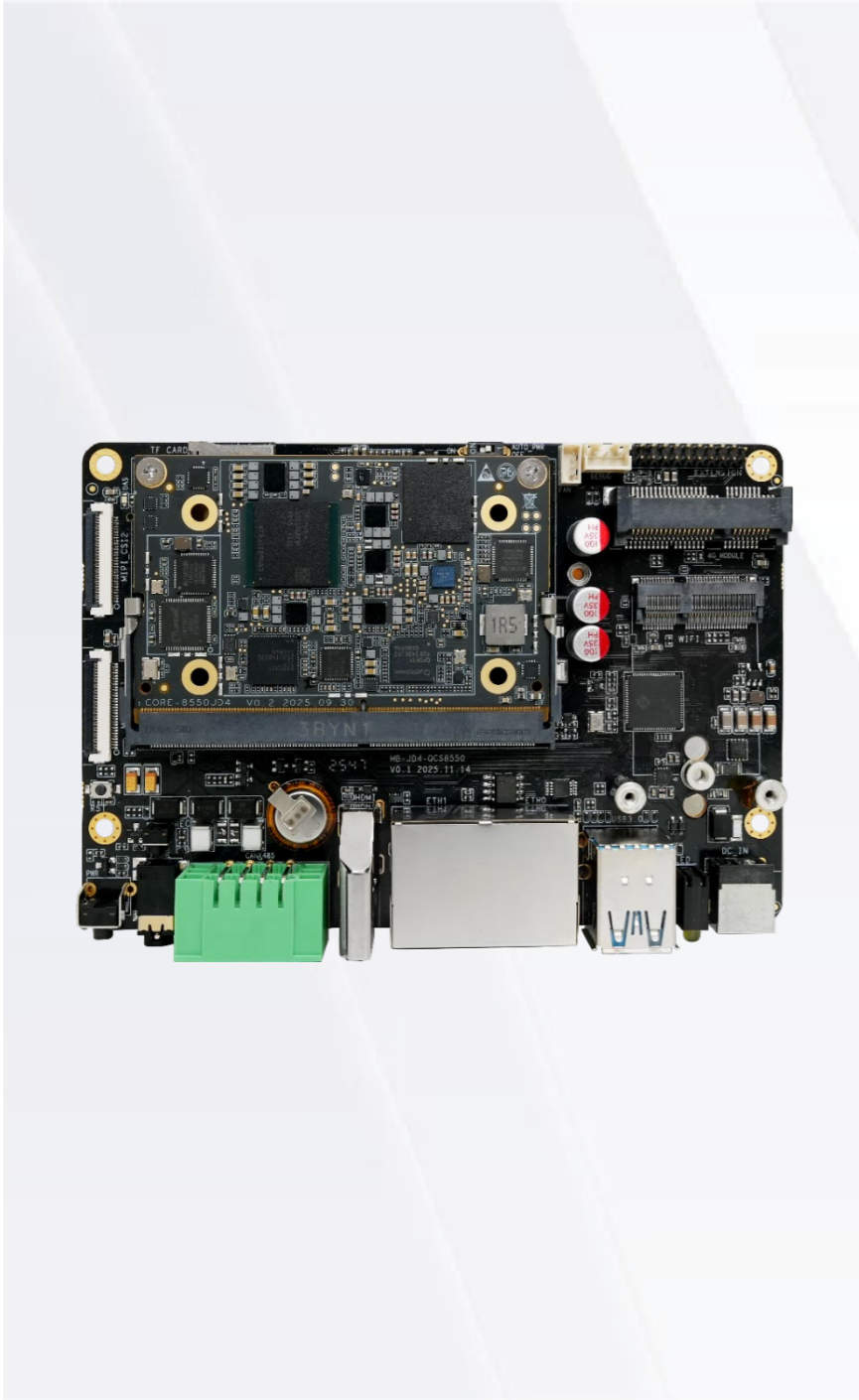
High-performance AI Mainboard

V0.2 2026-3-12

FIREFLY TECHNOLOGY



Product features



High-performance AI processor QCS8550

Features an octa-core 64-bit high-performance Qualcomm Kryo CPU (QCS8550), based on the ARM architecture with a maximum frequency of up to 3.36GHz, delivering robust support for high-performance computing and multitasking.



48TOPS computing power NPU

Integrated with a 48TOPS NPU, it supports INT4/INT8/INT16/FP16 mixed-precision computing, enabling intelligent data processing, speech recognition, and image analysis to meet the AI application requirements of edge computing for most terminal devices.



Powerful image processing capability

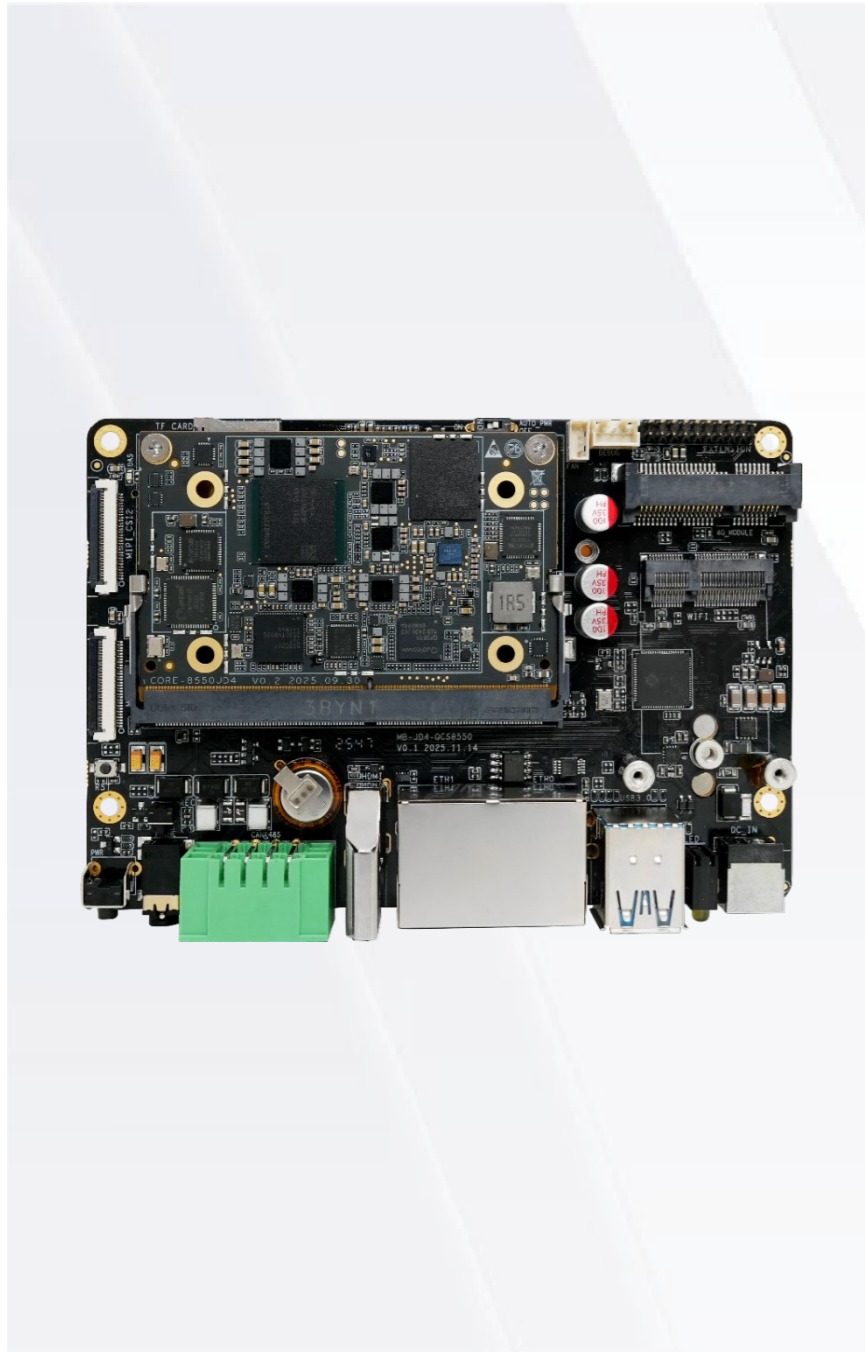
Integrated with the Adreno 740 GPU, it fully supports ray tracing technology and is compatible with OpenGL ES 3.2, Vulkan 1.2, and full-profile OpenCL 3.0. Combined with Hexagon neural network direct acceleration, it delivers enhanced graphics processing and AI computing performance.



Supports 8K video codec

Supports 8K@60fps/4K@240fps video decoding and 8K@30fps/4K@120fps video encoding; its powerful video codec capability enables 8K ultra-high-definition display with finer image quality.

Product features



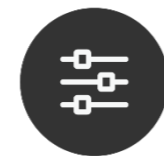
The private deployment of large language models

Support the privatization deployment of ultra-large-scale parametric models under the Transformer architecture, such as Deepseek-R1 series, Gemma series, Llama series, Qwen series, Phi series and other large language models.



Multiple deep learning frameworks

Supports QNN AI inference framework, as well as various deep learning frameworks: TensorFlow, TensorFlow Lite, PyTorch, ONNX, etc.



Abundant expansion interfaces

It provides a rich array of expansion interfaces such as MIPI-CSI, HDMI2.0, Mini PCIe, USB3.0, Type-C, RS485, RS232, CAN, I2C, UART, TF Card and SIM Card to meet peripheral expansion needs for various applications.



Wide range of application scenarios

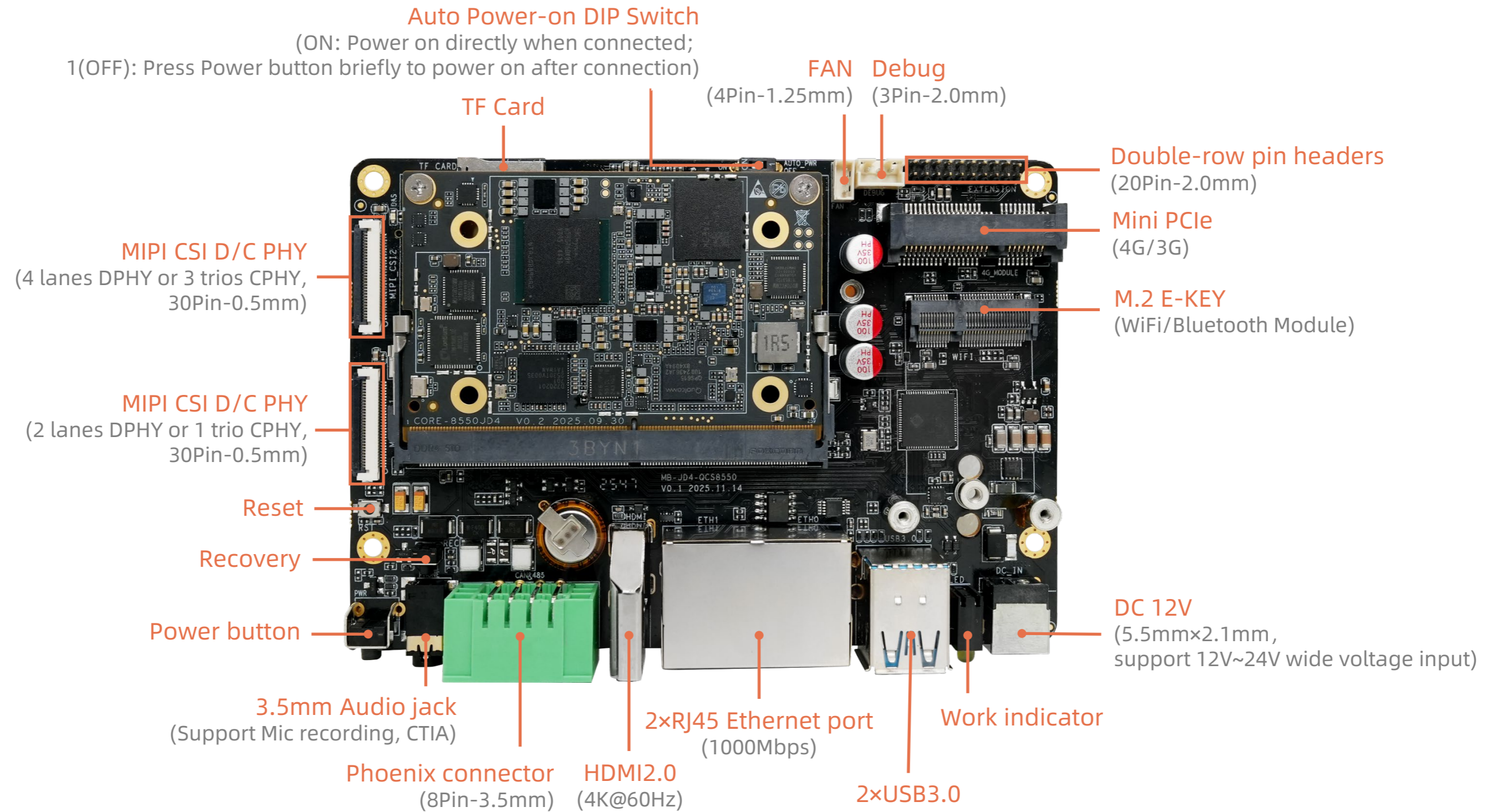
It is widely used in robotics, unmanned aerial vehicles (UAVs), cameras, edge computing AI, cloud gaming, computing power services, intelligent security, smart home and other industries and fields.

Specifications

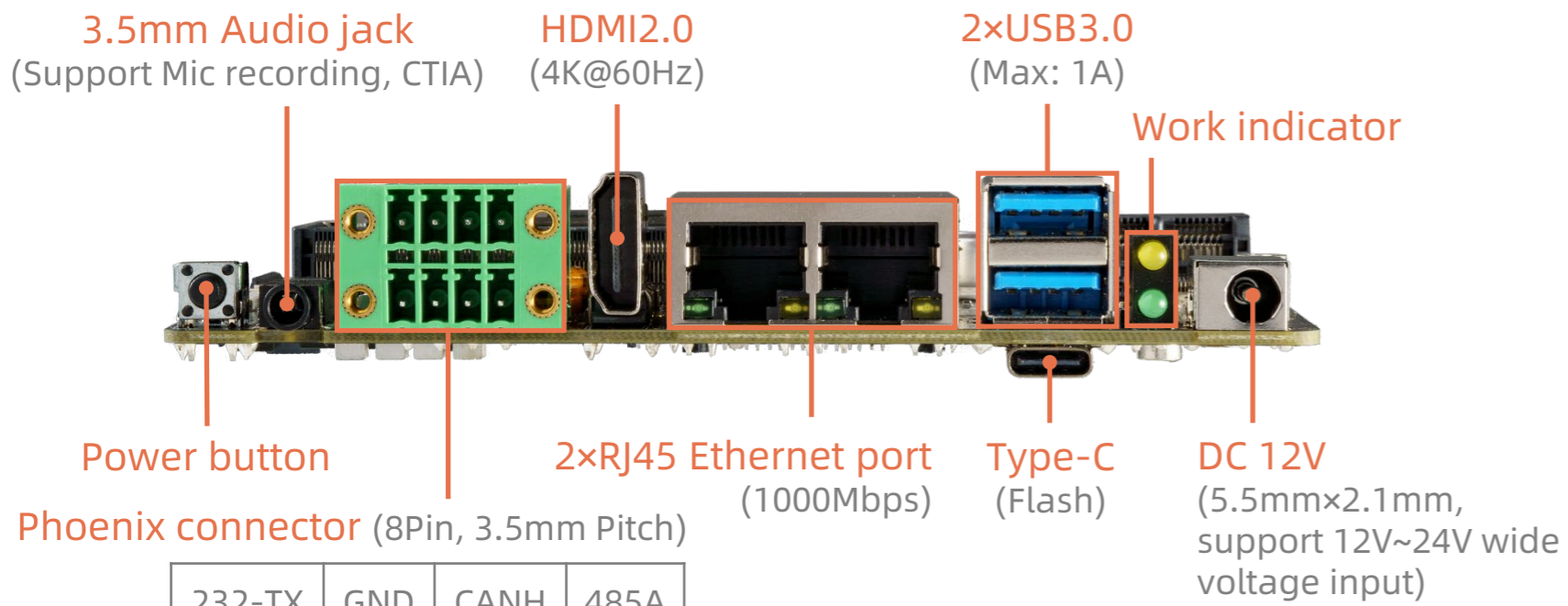


Specifications		
Basic Specifications	SOC	Qualcomm QCS8550
	CPU	Qualcomm Kryo® CPU: Octa-core 64-bit (1×GoldPlus@3.2GHz + (2+2)Gold@2.8GHz + 3×Silver@2.0GHz), 4nm advanced process, maximum frequency up to 3.36GHz
	GPU	Adreno 740 GPU: Supports ray tracing technology, OpenGL ES 3.2, Vulkan 1.2, full-profile OpenCL 3.0, and Adreno NN Direct
	NPU	Equipped with Qualcomm Spectra™ Cognitive ISP (Image Signal Processor), featuring three 18-bit 36MP ISPs
	ISP	Dual eNPU V3: Equipped with 4 HVX (Hexagon Vector Extensions), 1 HMX (Hexagon Matrix Extension); Computing power up to 48 TOPS (INT8), 12 TOPS (FP16)
	Codec	Video decoding: 8K@60fps/4K@240fps H.265/H.264/VP9/AV1 Video encoding: 8K@30fps/4K@120fps H.265/H.264 Supports concurrent 4K@60fps decoding and 4K@60fps encoding for wireless display scenarios
	RAM	16GB LPDDR5x
	Storage	256GB UFS4.0
	Storage expansion	1 × M.2 M-KEY (supports expansion of PCIe NVMe SSD, compatible with 2242/2260/2280 form factors), 1 × TF Card
	Power	DC 12V (5.5mm × 2.1mm, support 12V~24V wide voltage input)
	Power consumption	Normal: 4.8W(12V/400mA), Max: 18W(12V/1500mA)
	OS	Linux
	Software support	Supports on-premises deployment of large-scale parameter models based on the Transformer architecture, such as large language models (LLMs) including the Deepseek-R1 series, Gemma series, Llama series, Qwen series, Phi series, etc. Supports the QNN AI inference framework, as well as various deep learning frameworks including TensorFlow, TensorFlow Lite, PyTorch, ONNX, etc.
	Size	122.89mm × 85.04mm × 31.55mm
	Weight	Without heatsink: 117g; With heatsink: 165g
Environment	Operating Temperature: -20°C ~ 60°C, Storage Temperature: -20°C ~ 70°C, Operating Humidity: 10% ~ 90%RH (No condensation)	
Interface Specifications	Network	Ethernet: 2 × RJ45(1000Mbps) WiFi: Extend WiFi/Bluetooth module through M.2 E-KEY (2230), supporting 2.4GHz/5GHz dual band WiFi6 (802.11a/b/g/n/ac/ax) and Bluetooth 5.2 4G: Extend 4G LTE via Mini PCIe (Shared with 5G) 5G: Extend 5G via M.2 B-KEY (Shared with 4G, not mounted by default)
	Video input	2 × MIPI D/C PHY (4 lanes DPHY or 3 trios CPHY) + 2 × MIPI D/C PHY (2 lanes DPHY or 1 trio CPHY)
	Video output	1 × HDMI2.0 (4K@60Hz)
	Audio	1 × 3.5mm Audio jack (Supports MIC recording, American standard CTIA)
	USB	2 × USB3.0 (Max: 1A), 1 × Type-C (Flash)
	DIP switch	1 × Auto Power-on DIP Switch (ON: Power on directly when connected; 1(OFF): Press Power button briefly to power on after connection) 1 × Type-C function selection(ON: Debug; 1(OFF): Flash)
	Button	1 × Reset, 1 × Recovery, 1 × Power
	Other interfaces	1 × FAN (4Pin-1.25mm), 1 × SIM Card 1 × Double-row pin headers (20Pin-2.0mm): USB2.0, UART, 2 × I2C, Line in, Line out, GPIO 1 × Phoenix connector (8Pin-3.5mm): 1 × RS485, 1 × RS232, 1 × CAN 2.0

Interface description

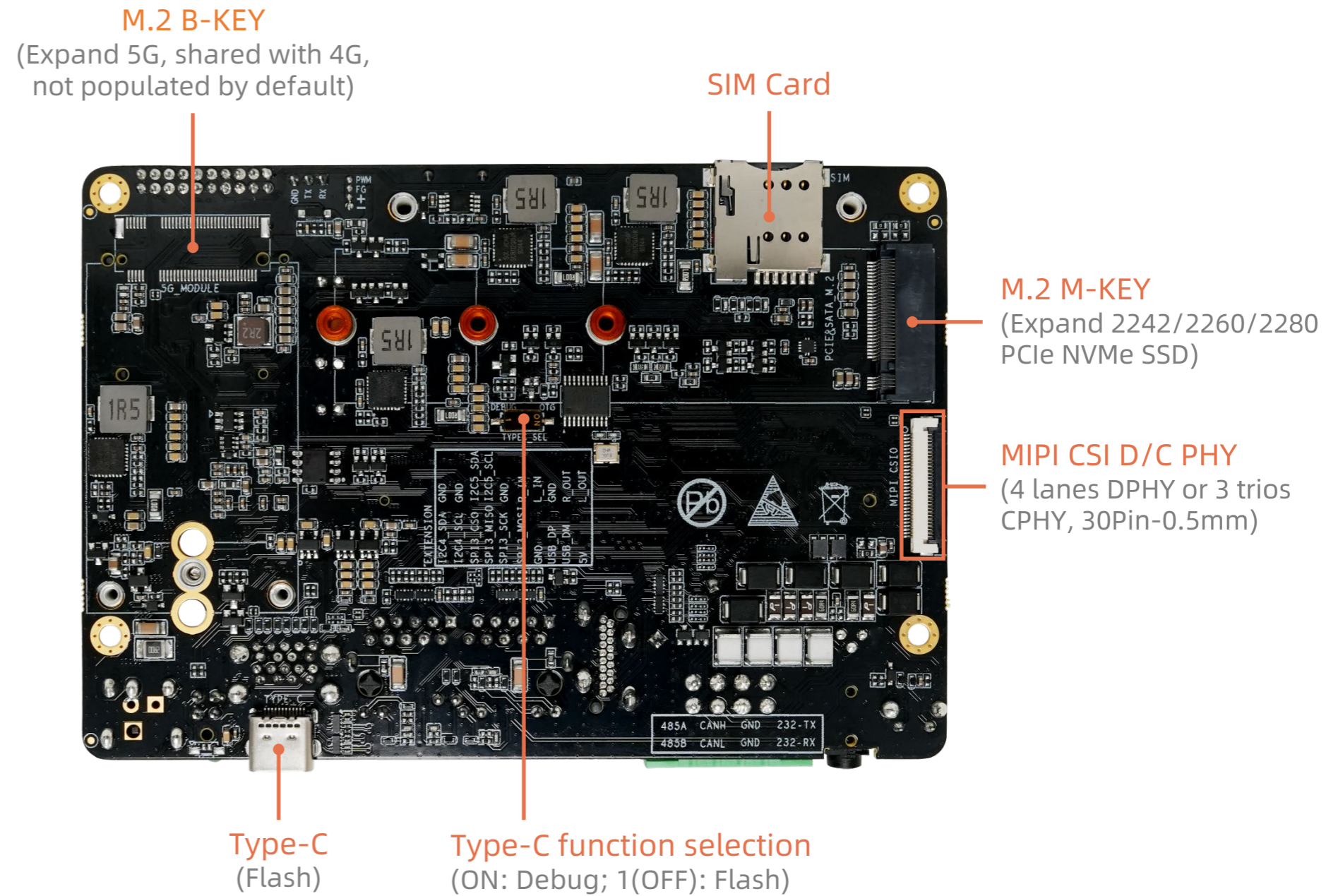


Interface description

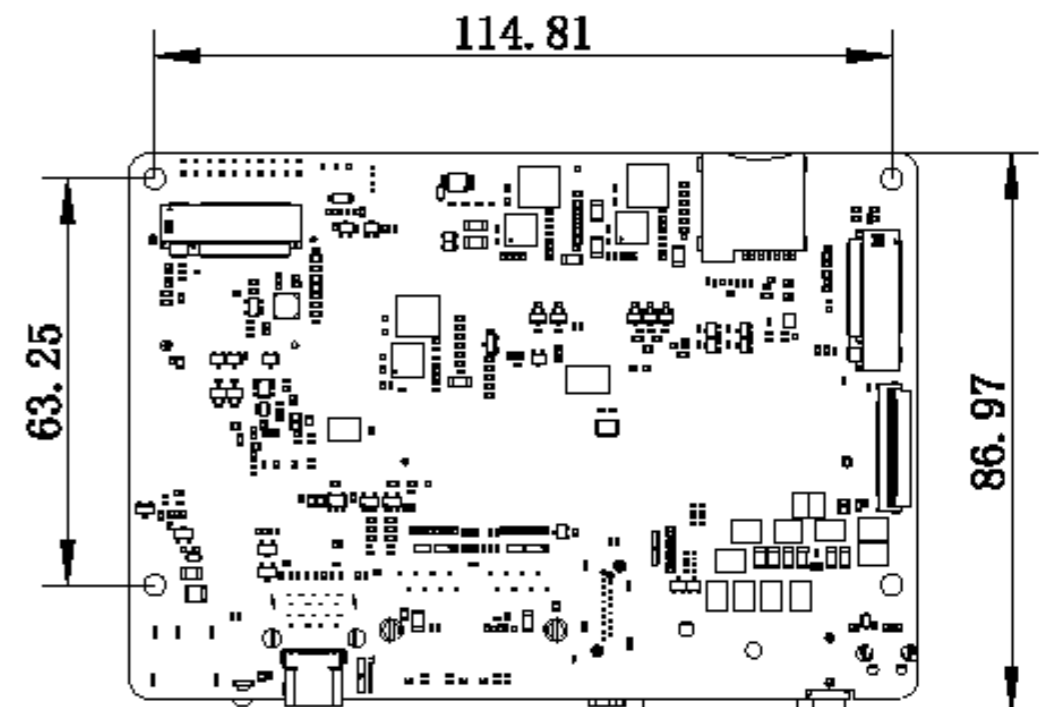
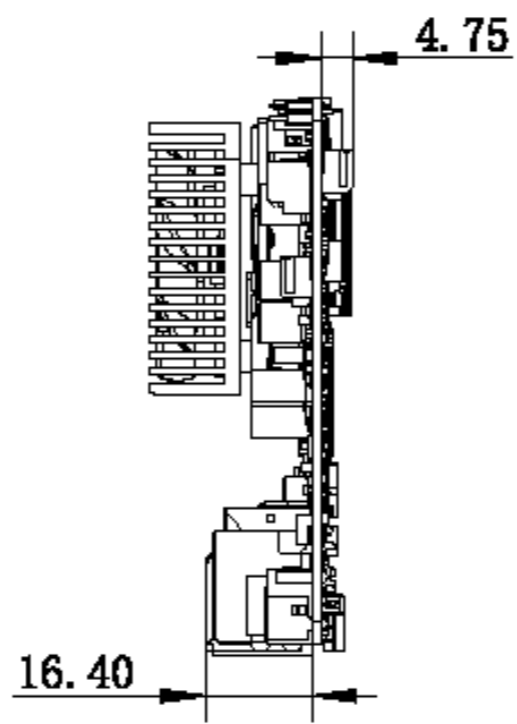
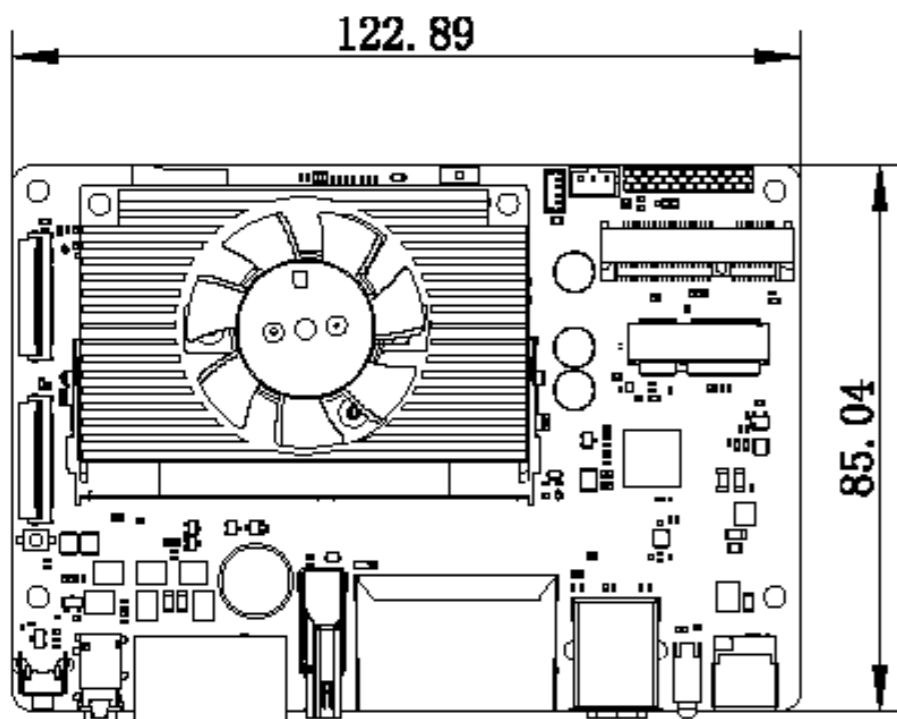
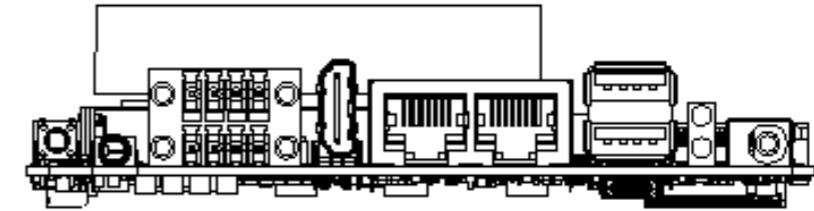
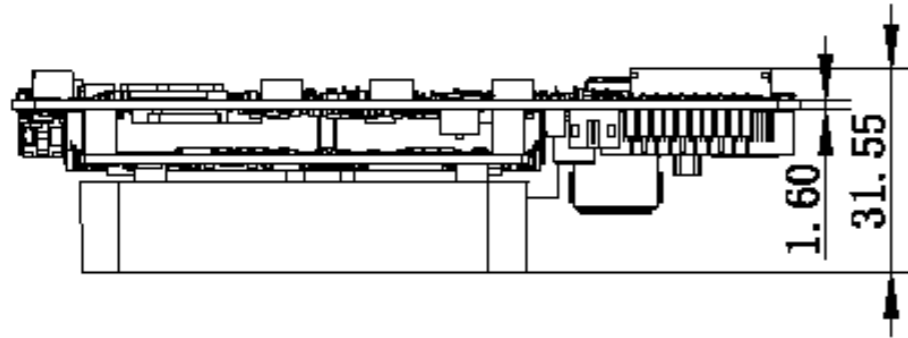


Phoenix connector (8Pin, 3.5mm Pitch)

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

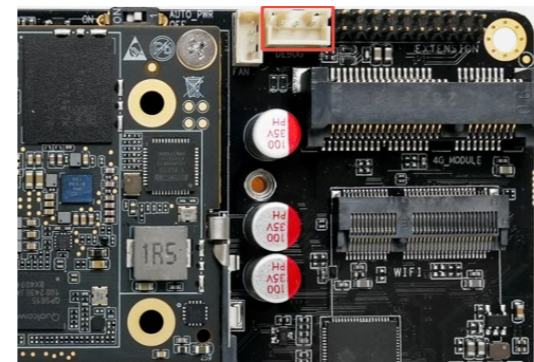


Dimension



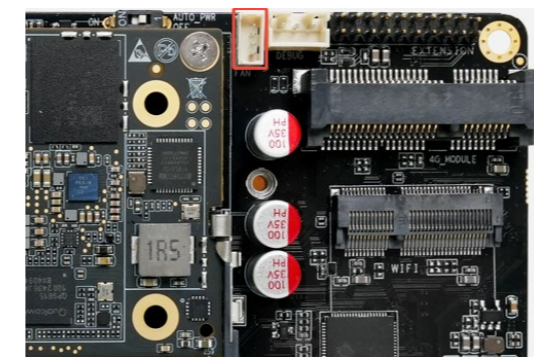
Interface definition

1. (J19) DEBUG: 3PIN 2.0mm pitch wafer socket



NO.	Definition	Power/V	NO.	Definition	Power/V
1	UART0_RXD_3V3	3.3	3	GND	
2	UART0_TXD_3V3	3.3			

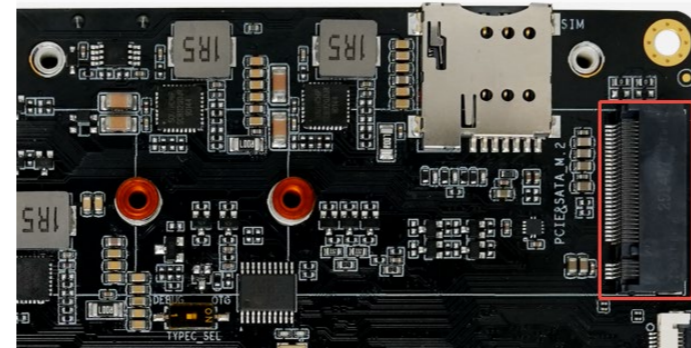
2. (J6) FAN: 4PIN 1.25mm pitch wafer socket



NO.	Definition	Power/V	NO.	Definition	Power/V
1	GND		2	FAN+ (5V Output)	5
3	FAN_TACH 【PWR_GPIO1/UART7_TX】	3.3	4	PWM1_CONN1 Output 【GPIO114】 [pull up resistor10K]	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	

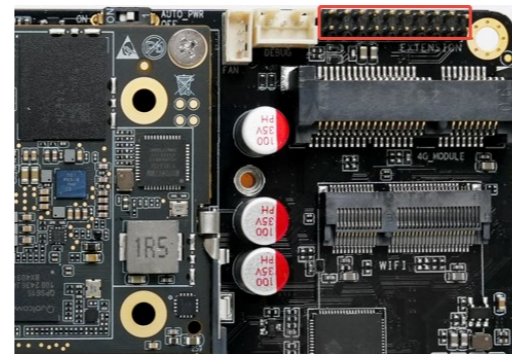


Interface definition

29	CON_DS0_PCIE0_RX1_M		30	NC	
31	CON_DS0_PCIE0_RX1_P		32	NC	
33	GND		34	NC	
35	CON_DS0_PCIE0_TX1_M (Series capacitor 100nF)		36	NC	
37	CON_DS0_PCIE0_TX1_P (Series capacitor 100nF)		38	DEVSLP [pull up resistor10K]	3.3
39	GND		40	NC	
41	CON_DS0_PCIE0_RX0_P	-	42	NC	
43	CON_DS0_PCIE0_RX0_M	-	44	NC	
45	GND		46	NC	
47	CON_DS0_PCIE0_TX0_M (Series capacitor 100nF)	-	48	NC	
49	CON_DS0_PCIE0_TX0_P (Series capacitor 100nF)	-	50	PCIE_WAKE	3.3
51	GND		52	PCIE0_CLKREQB_N (GPIO42)	3.3
53	PCIE0_EP_CLK_N	-	54	PCIE0_RESET_N	3.3
55	PCIE0_EP_CLK_P	-	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

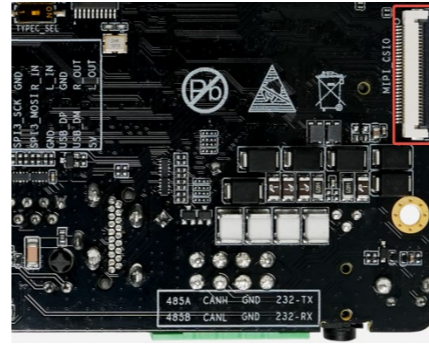
4. (J15) Double-row pin header EXTENSION INTERFACE 2*10PIN



NO.	Definition	Power/V	NO.	Definition	Power/V
1	VCC5V0_SYS (5.0V OUTPUT)	5.0 (MAX:500mA)	2	LOUT2 (40mW from ES8390)	3.3
3	USB_HOST0_DM	-	4	ROUT2 (40mW from ES8390)	3.3
5	USB_HOST0_DP	-	6	GND	
7	GND		8	LIN1 (to ES8390) (Series capacitor 1uF)	3.3
9	SM_GPIO_46_UART_TX (MIPI_DSI1_P0/I2S1_SCLK/GPIO185/ UART1_TX)	1.8	10	RIN1 (to ES8390) (Series capacitor 1uF)	3.3
11	SM_GPIO_47_UART_RX (MIPI_DSI1_N0/I2S1_WSI/GPIO186/UART1_RX)	1.8	12	GND	
13	SM_GPIO_176_I2S2_WS (MIPI_DSI1_N3/I2S2_WSI/GPIO125/UART3_RX)	1.8	14	I2C_HUB0_SCL_3V3_GPIO21 (GPIO190) (Pull-up resistor 4.7K)	3.3
15	SM_GPIO_175_I2S2_CLK (MIPI_DSI1_P3/I2S2_SCLK/GPIO124/UART3_TX)	1.8	16	I2C_HUB0_SDA_3V3_GPIO20 (GPIO189) (Pull-up resistor 4.7K)	3.3
17	I2C_HUB0_SCL_3V3_GPIO206 (CAM_XLR0 / GPIO69) (Pull-up resistor 4.7K)	3.3	18	HMT_BLE_UART_TX(GPIO105)	
19	I2C_HUB0_SDA_3V3_GPIO206 (CAM_XLR1 / GPIO70) (Pull-up resistor 4.7K)	3.3	20	HMT_BLE_UART_RX(GPIO106)	

Interface definition

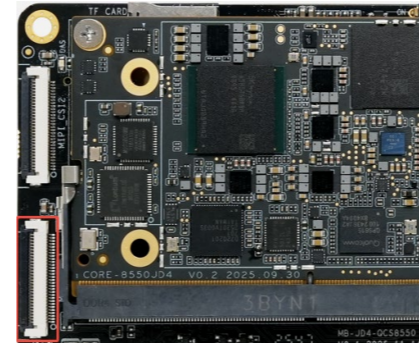
5. (J7) MIPI CSI0 30PIN 0.5mm pitch



NO.	Definition	Power/V	NO.	Definition	Power/V
1	CAM0_I2C_SDA 【GPIO184】 Pull-up resistor 2.2K	1.8	16	GND	
2	CAM0_I2C_SCL 【GPIO128】 Pull-up resistor 2.2K	1.8	17	CSI0_NC_CLK_P	-
3	NFC_ESE_SPI_MOSI 【GPIO77】	1.8	18	CSI0_A0_CLK_M	-
4	CAM0_RESET_H 【Extended IO】	1.8	19	GND	
5	GND		20	CSI0_C1_LN2_P	-
6	CAM0_MCLK 【GPIO46】	1.8	21	CSI0_A2_LN2_M	-
7	CAM3_PWDN 【PWR_GPIO187】	1.8	22	GND	
8	CAM0_RESET_H 【Extended IO】	1.8	23	CSI0_B2_LN3_P	-
9	CAM0_MCLK 【GPIO46】	1.8	24	CSI0_C2_LN3_M	-
10	GND		25	GND	
11	CSI0_B0_LN0_P	-	26	NC	-
12	CSI0_C0_LN0_M	-	27	NC	-
13	GND		28	GND	
14	CSI0_A1_LN1_P	-	29	VCC_CSI1 (5.0V OUTPUT)	5.0
15	CSI0_B1_LN1_M	-	30	VCC_CSI1 (5.0V OUTPUT)	5.0

Interface definition

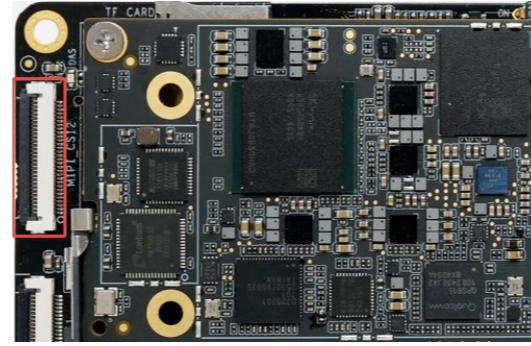
6. (J13) MIPI CSI1 30PIN 0.5mm pitch



NO.	Definition	Power/V	NO.	Definition	Power/V
1	CAM1_I2C_SDA 【GPIO64】 Pull-up resistor 2.2K	1.8	16	GND	
2	CAM1_I2C_SCL 【GPIO65】 Pull-up resistor 2.2K	1.8	17	CSI7_NC_CLK_P	-
3	CAM1_PWDN 【GPIO76】	1.8	18	CSI7_A0_CLK_M	-
4	CAM1_RESET_H 【Extended IO】	1.8	19	GND	
5	GND		20	CSI6_B0_LN0_P	-
6	CAM_MCLK1 【GPIO47】	1.8	21	CSI6_C0_LN0_M	-
7	CAM4_PWDN 【PWR_GPIO5】	1.8	22	GND	
8	CAM1_RESET_H 【Extended IO】	1.8	23	CSI6_A1_LN1_P	-
9	CAM1_MCLK 【GPIO47】	1.8	24	CSI6_B1_LN1_M	-
10	GND		25	GND	
11	CSI7_B0_LN0_P	-	26	CSI6_NC_CLK_P	-
12	CSI7_C0_LN0_M	-	27	CSI6_A0_CLK_M	-
13	GND		28	GND	
14	CSI7_A1_LN1_P	-	29	VCC_CSI2 (5.0V OUTPUT)	5.0
15	CSI7_B1_LN1_M	-	30	VCC_CSI2 (5.0V OUTPUT)	5.0

Interface definition

7. (J16) MIPI CSI2 30PIN 0.5mm pitch

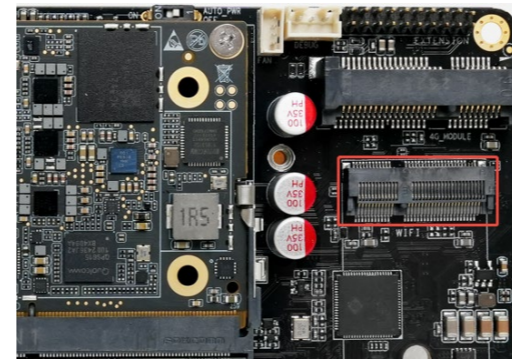


NO.	Definition	Power/V	NO.	Definition	Power/V
1	CAM2_I2C_SDA 【GPIO62】 Pull-up resistor 2.2K	1.8	16	GND	
2	CAM2_I2C_SCL 【GPIO63】 Pull-up resistor 2.2K	1.8	17	CSI1_NC_CLK_P	-
3	CAM_MCLK2 【GPIO51】	1.8	18	CSI1_A0_CLK_M	-
4	CAM2_RESET_H 【Extended IO】	1.8	19	GND	
5	GND		20	CSI1_C1_LN2_P	-
6	CAM2_MCLK 【GPIO50】	1.8	21	CSI1_A2_LN2_M	-
7	CAM5_PWDN 【GPIO80】	1.8	22	GND	
8	CAM2_RESET_H 【Extended IO】	1.8	23	CSI1_B2_LN3_P	-
9	CAM2_MCLK 【GPIO50】	1.8	24	CSI1_C2_LN3_M	-
10	GND		25	GND	
11	CSI1_B0_LN0_P	-	26	NC	-
12	CSI1_C0_LN0_M	-	27	NC	-
13	GND		28	GND	
14	CSI1_A1_LN1_P	-	29	VCC_CSI3 (5.0V OUTPUT)	5.0
15	CSI1_B1_LN1_M	-	30	VCC_CSI3 (5.0V OUTPUT)	5.0

Interface definition



8. (U16) 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_USB3_DP	-	4	WIFI_3V3 (3.3V Output)	3.3
5	HUB_USB3_DM	-	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 (PWR_GPIO2)	3.3
21	NC		22	NC	
23	NC		32	NC	
33	GND		34	NC	
35	SOM_PCIE1_TX0_P (Series capacitor 100nF)	-	36	NC	

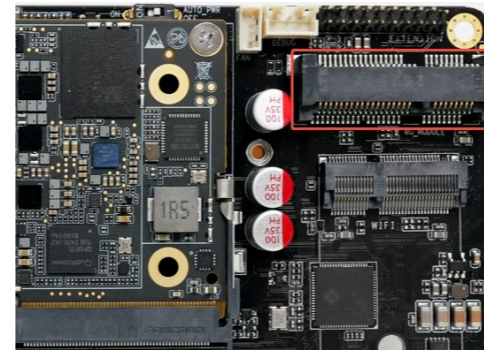


Interface definition

37	SOM_PCIE1_TX0_M (Series capacitor 100nF)	-	38	AP_M2_WAKE_BT (Extended IO)	3.3
39	GND		40	NC	
41	SOM_PCIE1_RX0_P	-	42	NC	
43	SOM_PCIE1_RX0_M	-	44	NC	
45	GND		46	NC	
47	SOM_PCIE1_REFCLK_P	-	48	NC	
49	SOM_PCIE1_REFCLK_M	-	50	32KOUT_WIFI (GPIO176)	3.3
51	GND		52	PCIE1_RST* (GPIO43)	3.3
53	PCIE1_CLK_REQ_N (GPIO45)	-	54	BT_DISABLE_L (GPIO61)	3.3
55	PCIE_WAKE (GPIO41)	-	56	WIFI_DISABLE_L (GPIO79)	3.3
57	GND		58	NC	
59	SOM_PCIE1_TX1_P (Series capacitor 100nF)	-	60	NC	
61	SOM_PCIE1_TX1_M (Series capacitor 100nF)		62	NC	
63	GND		64	NC	
65	SOM_PCIE1_RX1_P		66	NC	
67	SOM_PCIE1_RX1_M		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

11. (U21) MINI PCIe 4G



NO.	Definition	Power/V	NO.	Definition	Power/V
1	NC		2	VCC3V5_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 Pull-up resistor 10K	3.8
23	NC		24	NC	
25	NC		26	GND	
27	GND		28	NC	

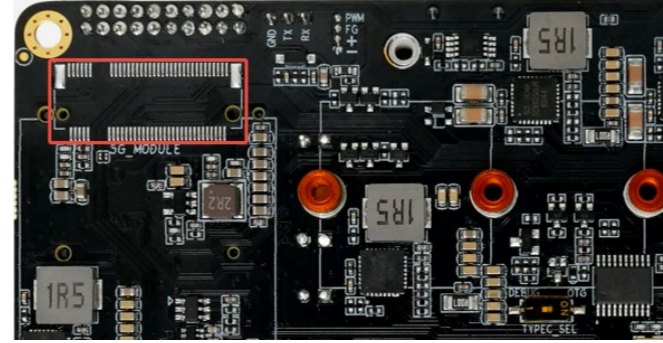


Interface definition

29	GND		30	NC	
31	NC		32	NC	
33	NC		34	GND	
35	GND		36	HUB_USB4_DM	-
37	GND		38	HUB_USB4_DP	-
39	VCC3V5_4G (3.5V Output)	3.5	40	GND	
41	VCC3V5_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	VCC3V5_4G (3.5V Output)	3.5

Interface definition

12. (U26) 5G NGFF-M.2-B-KEY (Default: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# Pull-up resistor 10K	3.5
7	HUB_5G_USB2_DP	-	8	NC	
9	HUB_5G_USB2_DM	-	10	NC	
11	GND		20	NC	
21	NC		22	NC	
23	NC		24	NC	
25	NC		26	NC	
27	GND		28	NC	
29	HUB_USB4_SSRXN	-	30	UIM_RST	1.8
31	HUB_USB4_SSRXP	-	32	UIM_CLK	1.8
33	GND		34	UIM_DAT	1.8
35	HUB_USB4_SSTXN (Series capacitor 100nF)	-	36	UIM_PWR	1.8
37	HUB_USB4_SSTXP (Series capacitor 100nF)	-	38	NC	

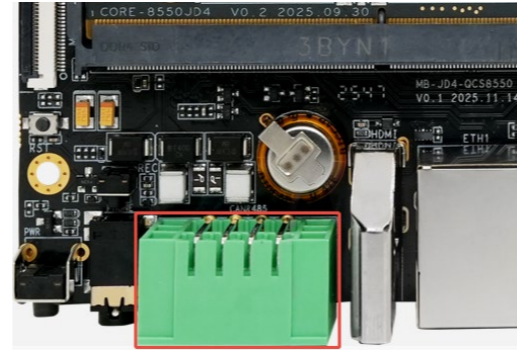
Interface definition



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	VCC3V5_4G (3.5V Output)	3.5
71	GND		72	VCC3V5_4G (3.5V Output)	3.5
73	GND		74	VCC3V5_4G (3.5V Output)	3.5
75	NC				

Interface definition


13. (J3) RS485/RS232/CAN 2*4PIN 3.5mm pitch (GREEN)





NO.	Definition	Power/V	NO.	Definition	Power/V
1	RS485_A		2	RS485_B	5.0
3	CAN_H	-	4	CAN_L	-
5	GND		6	GND	
7	RS232_TXD_1	-	8	RS232_RXD_1	-




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