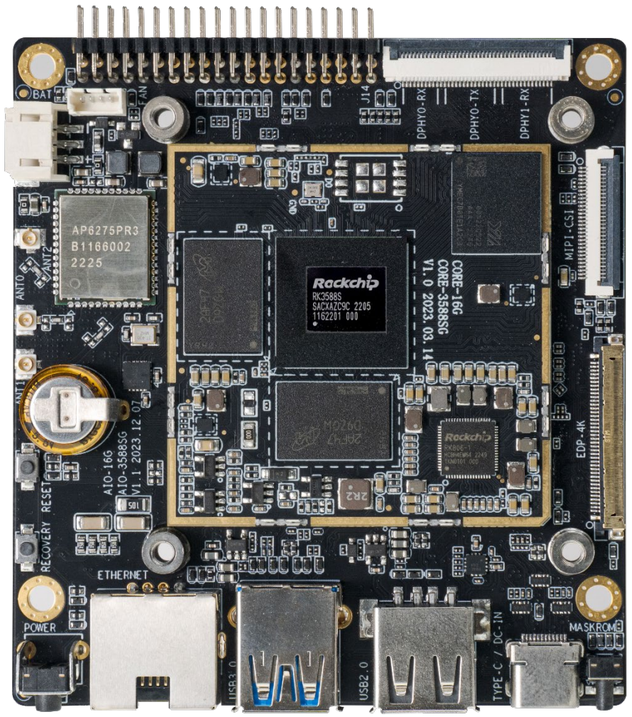
AIO-3588SG

Octa-core 8K AI Mainboard



V1.1　2025-3-12

T-CHIP INTELLIGENCE TECHNOLOGY

Product features

New-gen AIoT SoC RK3588S

RK3588S is Rockchip's new-gen flagship AIoT SoC with the 8nm lithography process. Equipped with an octa-core 64-bit CPU, its frequency is up to 2.4GHz.

Built-in 6TOPS powerful computing power NPU

Supports mixed operations such as INT4/INT8/INT16, and can achieve network model transformation based on TensorFlow/MXNet/PyTorch and other frameworks.

8K video encoding and decoding

The computer supports 8K@60fps H.265/VP9 video decoding and 8K@30fps H.265/H.264 video encoding. It also supports encoding and decoding simultaneously – up to 32-channel 1080P@30fps decoding and 16-channel 1080P@30fps encoding can be achieved.

Super-large 32GB RAM

Up to 32GB of super-large RAM can be configured, exceeding the limit of the previous RAM and delivering a faster response time. It is able to meet the product requirements for large RAM and high storage capacity.

Product features

Strong network communication capability

Gigabit Ethernet RJ45, 2.4GHz/5GHz dual-band WiFi6 (802.11ax), and Bluetooth 5.0 enable higher-speed network communication.

Supporting various operating systems

Android 12.0, Ubuntu, Debian11, Buildroot, RTLinux and Kylin Linux are supported. The reliable operation provides a safe and stable system environment for product research and production.

A variety of interfaces

It has rich expansion interfaces such as Header-40P-2.0mm pin header can be expanded: (CAN/ UART/ VCC/ USB2.0/ I2C/ SPI/ SARADC/ SPEAKER/ Debug), FPC-40P-0.5mm (DPHY0-RX/DPHY0-TX/ DPHY1-RX), USB3.1(Gen1), USB2.0, etc.

A wide range of applications

The mainboard can be widely used in edge computing, Artificial Intelligence, cloud computing, VR/AR, blockchain, smart security, smart home, smart retail and intelligent industry.

Specifications

Specifications		
Basic Specifications	SOC	RK3588S
	CPU	Octa-core 64-bit (4×Cortex-A76+4×Cortex-A55), 8nm lithography process, 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	6 TOPS, support INT4/INT8/INT16 mixed operation, support framework switching of TensorFlow / MXNet / PyTorch / Caffe
	VPU	Video decoding: 8K@60fps H.265/VP9/AVS2, 8K@30fps H.264 AVC/MVC, 4K@60fps AV1, 1080P@60fps MPEG-2/-1/VC-1/VP8 Video encoding: 8K@30fps H.265/H.264
	RAM	4GB/8GB/16GB/32GB 64-bit LPDDR4/LPDDR4x
	Storage	16GB/32GB/64GB/128GB/256GB eMMC
	Power	DC 12V, 2.5A and higher (Support 9V~36V wide voltage input, PD power adapter is recommended)
	OS	Android 12.0, Ubuntu, Debian11, Buildroot, RTLinux, Kylin Linux
	Size	88mm × 81mm
	Weight	≈71g
	Power Consumption	Max: 15.6W(12V/1.3A), Normal: 5W(12V/0.42A), Min: 0.18W(12V/15mA)
	Environment	Operating Temperature: -20℃ ~ 60℃, Storage Temperature: -20℃ ~ 70℃, Operating Humidity: 10% ~ 90%RH (non-condensing)
Interface Specifications	Ethernet	1 × Gigabit Ethernet (RJ45/1000Mbps)
	Wireless Network	2.4GHz/5GHz dual-band WiFi6 (802.11 a/b/g/n/ac/ax), Bluetooth5.0
	Video Output	1 × MIPI-DSI (up to 4K@60fps), 1 × DP1.4 (up to 8K@30fps), 1 × eDP1.3 (4 Lanes/up to 4K@60Hz) * Up to three-screen output with different displays can be achieved
	Video Input	1 × MIPI-CSI (30P-0.5mm, 1×4Lanes or 2×2Lanes, 2.5Gbps/Lane)
	Audio	1 × DP1.4 audio output, 1 × Speaker (it is connected to the 4Pin of Header-40P-2.0mm)
	USB	1 × USB3.1 (Gen1), 3 × USB2.0 (Standard USB2.0 Port, Header-40P capable of providing 4 Pins, Wafer), 1 × USB-C (DP1.4(8K@30fps)/OTG/PD fast charging)
	Other Interfaces	1 × Header-40P-2.0mm (CAN/UART/VCC/USB2.0/I2C/SPI/SARADC/SPEAKER/Debug), 1 × FPC-40P-0.5mm (MIPI DPHY0-RX/MIPI DPHY0-TX/MIPI DPHY1-RX), 1 × FPC_TP

Interface description

Header-2×20P-20mm
CAN/UART/VCC/USB2.0/I2C/
SPI/SARADC/SPEAKER/Debug

FPC-40P-0.5mm
MIPI DPHY0-RX/MIPI DPHY0-TX/
MIPI DPHY1-RX

FAN
4P-1.25mm

Battery
3P-2.0mm, 2-cell(7.4V)

Bluetooth ANT2

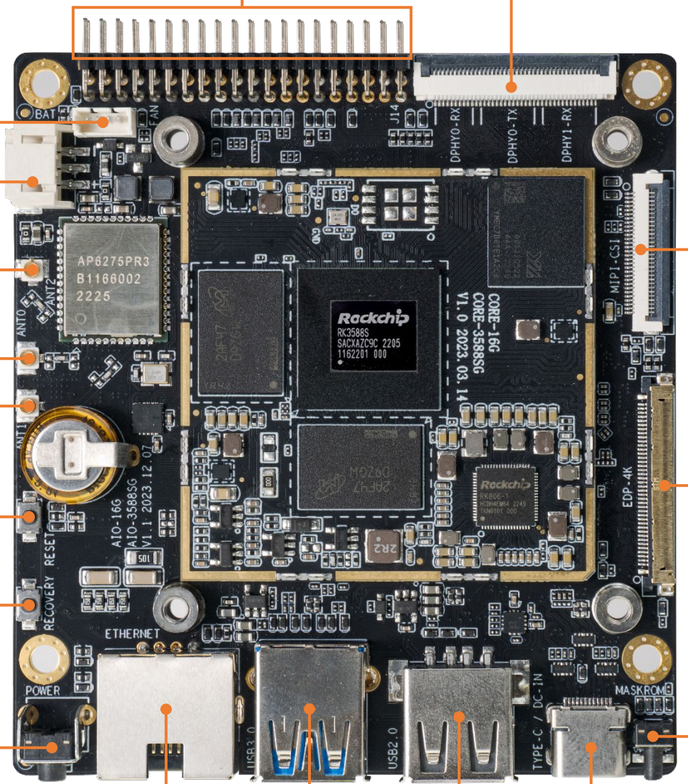
WiFi ANT0

WiFi ANT1

Reset

Recovery

Power



MIPI-CSI
30P-0.5mm
1×4Lanes or 2×2Lanes
2.5Gbps/Lane

EDP
40P-0.5mm
4Lanes
4K@60Hz

MaskRom

Gigabit Ethernet
1000Mbps
RJ45

USB3.1
Gen1
Max: 500mA

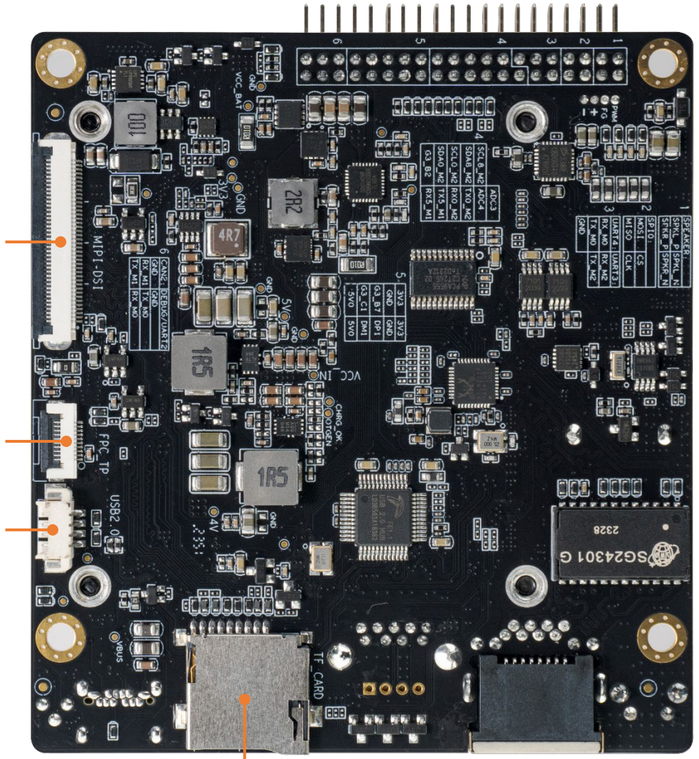
USB2.0
Max: 500mA

USB-C
USB3.1 OTG
DP1.4(8K@30fps)
PD fast charging(9V 3A/12V 2A)

MIPI-DSI
40P-0.5mm
4K@60fps

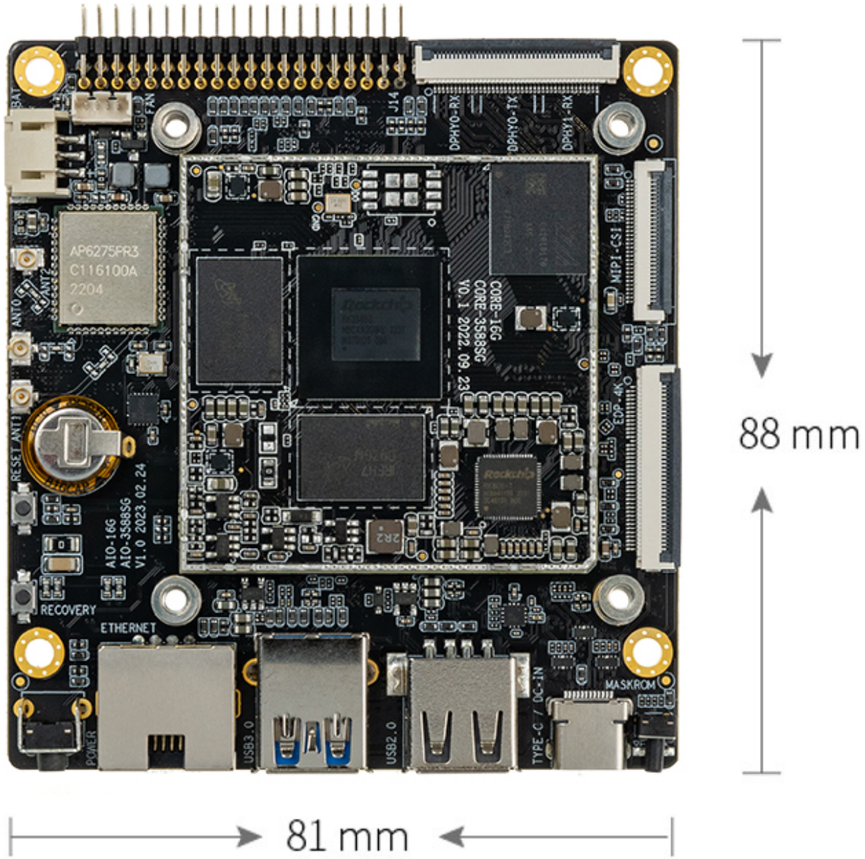
FPC_TP

USB2.0



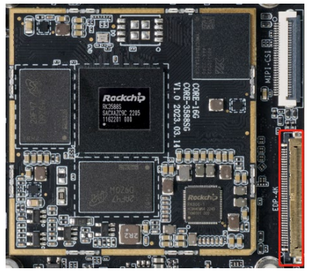
TF Card

Dimension



Interface definition

1. EDP_Display_Interface 40 PIN 0.5mm Pitch (J22: EDP)

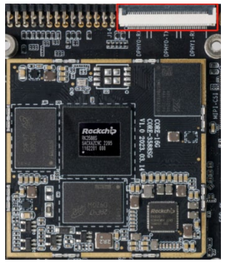


NO.	Definition	Power/V	NO.	Definition	Power/V
1	NC		21	VCC3V3_EDP (3.3V OUTPUT)	3.3V
2	GND		22	LCD_ST (Default： NC)	3.3V
3	EDP_TX_D3N (Series capacitor 100nF)	-	23	GND	
4	EDP_TX_D3P (Series capacitor 100nF)	-	24	GND	
5	GND		25	GND	
6	EDP_TX_D2N (Series capacitor 100nF)	-	26	GND	
7	EDP_TX_D2P (Series capacitor 100nF)	-	27	EDP_HPDIN_M1 INPUT【GPIO1_A6_d】	3.3V
8	GND		28	BL_GND	
9	EDP_TX_D1N (Series capacitor 100nF)	-	29	BL_GND	
10	EDP_TX_D1P (Series capacitor 100nF)	-	30	BL_GND	
11	GND		31	BL_GND	
12	EDP_TX_D0N (Series capacitor 100nF)	-	32	EDP_BL_EN 【Extended IO】	3.3V
13	EDP_TX_D0P (Series capacitor 100nF)	-	33	EDP_BL_PWM14_M1【GPIO4_B2_u】	3.3V
14	GND		34	NC	

Interface definition

15	EDP_TX_AUXP (Series capacitor 100nF)	-	35	NC	
16	EDP_TX_AUXN (Series capacitor 100nF)	-	36	BL_Power OUTPUT	5~21V
17	GND		37	BL_Power OUTPUT	5~21V
18	VCC3V3_EDP (3.3V OUTPUT)	3.3V	38	BL_Power OUTPUT	5~21V
19	VCC3V3_EDP (3.3V OUTPUT)	3.3V	39	BL_Power OUTPUT	5~21V
20	VCC3V3_EDP (3.3V OUTPUT)	3.3V	40	NC	

2. MIPI_Display_Interface 40 PIN 0.5mm Pitch (J19: DP TX/RX)

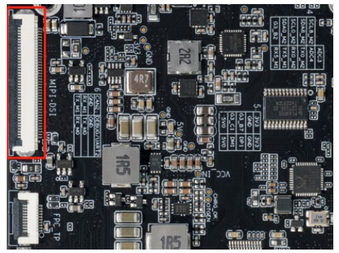


NO.	Definition	Power/V	NO.	Definition	Power/V
1	MIPI_DPHY0_RX_D3P	-	21	MIPI_DPHY0_TX_D1N/MIPI_CPHY0_TX_TRIO0_C	-
2	MIPI_DPHY0_RX_D3N/MIPI_CPHY0_RX_TRIO2_C	-	22	MIPI_DPHY0_TX_D1P/MIPI_CPHY0_TX_TRIO1_A	-
3	MIPI_DPHY0_RX_D2P/MIPI_CPHY0_RX_TRIO2_B	-	23	GND	
4	MIPI_DPHY0_RX_D2N/MIPI_CPHY0_RX_TRIO2_A	-	24	MIPI_DPHY0_TX_D0N/MIPI_CPHY0_TX_TRIO0_A	-
5	MIPI_DPHY0_RX_CLKP/MIPI_CPHY0_RX_TRIO1_C	-	25	MIPI_DPHY0_TX_D0P/MIPI_CPHY0_TX_TRIO0_B	-
6	MIPI_DPHY0_RX_CLKN/MIPI_CPHY0_RX_TRIO1_B	-	26	GND	
7	MIPI_DPHY0_RX_D1P/MIPI_CPHY0_RX_TRIO1_A	-	27	MIPI_DPHY1_RX_D3P	-
8	MIPI_DPHY0_RX_D1N/MIPI_CPHY0_RX_TRIO0_C	-	28	MIPI_DPHY1_RX_D3N/MIPI_CPHY1_RX_TRIO2_C	-

Interface definition

9	MIPI_DPHY0_RX_D0P/MIPI_CPHY0_RX_TRIO0_B	-	29	GND	
10	MIPI_DPHY0_RX_D0N/MIPI_CPHY0_RX_TRIO0_A	-	30	MIPI_DPHY1_RX_D2P/MIPI_CPHY1_RX_TRIO2_B	-
11	GND		31	MIPI_DPHY1_RX_D2N/MIPI_CPHY1_RX_TRIO2_A	-
12	MIPI_DPHY0_TX_D3N/MIPI_CPHY0_TX_TRIO2_C	-	32	GND	
13	MIPI_DPHY0_TX_D3P	-	33	MIPI_DPHY1_RX_CLKP/MIPI_CPHY1_RX_TRIO1_C	-
14	GND		34	MIPI_DPHY1_RX_CLKN/MIPI_CPHY1_RX_TRIO1_B	-
15	MIPI_DPHY0_TX_D2N/MIPI_CPHY0_TX_TRIO2_A	-	35	GND	
16	MIPI_DPHY0_TX_D2P/MIPI_CPHY0_TX_TRIO2_B	-	36	MIPI_DPHY1_RX_D1P/MIPI_CPHY1_RX_TRIO1_A	-
17	GND		37	MIPI_DPHY1_RX_D1N/MIPI_CPHY1_RX_TRIO0_C	-
18	MIPI_DPHY0_TX_CLKN/MIPI_CPHY0_TX_TRIO1_B	-	38	GND	
19	MIPI_DPHY0_TX_CLKP/MIPI_CPHY0_TX_TRIO1_C	-	39	MIPI_DPHY1_RX_D0P/MIPI_CPHY1_RX_TRIO0_B	-
20	GND		40	MIPI_DPHY1_RX_D0N/MIPI_CPHY1_RX_TRIO0_A	-

3. MIPI_Display_Interface 40 PIN 0.5mm Pitch (J18: DSI)



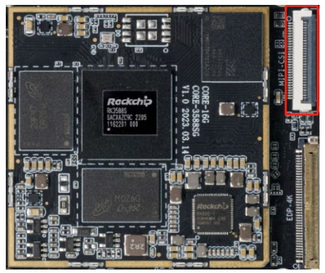
NO.	Definition	Power/V	NO.	Definition	Power/V
1	VCC3V3_MIPI (3.3V OUTPUT)	3.3V	21	MIPI_DPHY1_TX_D3P	-
2	NC		22	GND	

Interface definition

3	TP0_RST_L【Extended IO】	3.3V	23	NC	
4	TP0_INT_L 【GPIO1_B5_u】	3.3V	24	NC	
5	I2C6_SDA_M3 【GPIO4_B0_d】	3.3V	25	LCD0_RST (OUTPUT, Active L)	3.3V
6	I2C6_SCL_M3 【GPIO4_B1_u】	3.3V	26	NC	
7	GND		27	NC	
8	MIPI_DPHY1_TX_D0N	-	28	VCC_LCD1V8 (1.8V OUTPUT)	1.8V
9	MIPI_DPHY1_TX_D0P	-	29	NC	
10	GND		30	AVEE_5V5 (-5.5V OUTPUT)	-5.5V
11	MIPI_DPHY1_TX_D1N	-	31	AVEE_5V5 (-5.5V OUTPUT)	-5.5V
12	MIPI_DPHY1_TX_D1P	-	32	NC	
13	GND		33	AVDD_5V5 (+5.5V OUTPUT)	+5.5V
14	MIPI_DPHY1_TX_CLKN	-	34	AVDD_5V5 (+5.5V OUTPUT)	+5.5V
15	MIPI_DPHY1_TX_CLKP	-	35	VCC_LED-	
16	GND		36	VCC_LED-	
17	MIPI_DPHY1_TX_D2N	-	37	VCC_LED-	
18	MIPI_DPHY1_TX_D2P	-	38	VCC_LED+	38V
19	GND		39	VCC_LED+	38V
20	MIPI_DPHY1_TX_D3N	-	40	VCC_LED+	38V

Interface definition

4. MIPI_Camera_Interface 30 PIN 0.5mm Pitch (J7: CS0)

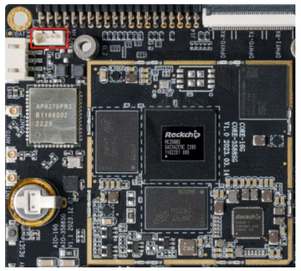


NO.	Definition	Power/V	NO.	Definition	Power/V
1	I2C7_SDA_M0【GPIO1_D1_d】 【M Board pull up resistance 2.2K】	1.8V	16	GND	
2	I2C7_SCL_M0【GPIO1_D0_d】 【M Board pull up resistance 2.2K】	1.8V	17	MIPI_CSI0_RX_CLK0P	-
3	MIPI_CAM1_PDN_L【GPIO3_C0_d】	1.8V	18	MIPI_CSI0_RX_CLK0N	-
4	MIPI_RESET0_CAM【GPIO1_D5_d】	1.8V	19	GND	
5	GND		20	MIPI_CSI0_RX_D2P	-
6	MIPI_MCLK1【GPIO3_A6_d】	1.8V	21	MIPI_CSI0_RX_D2N	-
7	MIPI_CAM2_PDN_L【GPIO1_C4_d】	1.8V	22	GND	
8	MIPI_RESET1_CAM【GPIO1_C1_z】	1.8V	23	MIPI_CSI0_RX_D3P	-
9	MIPI_MCLK2【GPIO1_B7_u】	1.8V	24	MIPI_CSI0_RX_D3N	-
10	GND		25	GND	
11	MIPI_CSI0_RX_D0P	-	26	MIPI_CSI0_RX_CLK1P	-
12	MIPI_CSI0_RX_D0N	-	27	MIPI_CSI0_RX_CLK1N	-
13	GND		28	GND	
14	MIPI_CSI0_RX_D1P	-	29	VCC5V0_SYS (5.5V Output)	5.0V

Interface definition

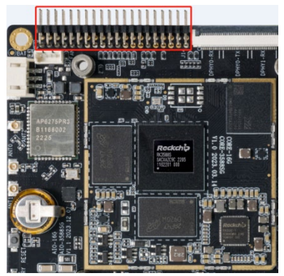
15	MIPI_CSI0_RX_D1N	-	30	VCC5V0_SYS (5.5V Output)	5.0V

5. FAN 4PIN 1.25mm Pitch wafer (WHITE) (J15)



NO.	Definition	Power/V	NO.	Definition	Power/V
1	GND		3	FG Input	3.3V
2	VCC5V0_SYS (5.0V OUTPUT)	5.0V	4	PWM1 OUTPUT【GPIO3_C4】	5.0V

6. 40PIN (20PIN×2) 2.0mm Pitch Double row needles (J14)



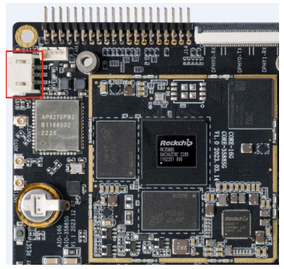
NO.	Definition	Power/V	NO.	Definition	Power/V
1	CAN2_TX_M1【GPIO0_D5_u】	1.8V	2	UART2_RX_M0【GPIO0_B6_d】	3.3V
3	CAN2_RX_M1【GPIO0_D4_u】	1.8V	4	UART2_TX_M0【GPIO0_B5_d】	3.3V

Interface definition

5	GND		6	GND	
7	VCC5V0_SYS (5.0V OUTPUT)	5.0V	8	VCC5V0_SYS (5.0V OUTPUT)	5.0V
9	GPIO3_C1_D	1.8V	10	USB20_HOST1_DM	-
11	GPIO3_B7_d	1.8V	12	USB20_HOST1_DP	-
13	GND		14	GND	
15	VCC3V3_SYS (3.3V OUTPUT)	3.3V	16	VCC3V3_SYS (3.3V OUTPUT)	3.3V
17	GPIO3_B2_d	1.8V	18	UART5_RX_M1【GPIO3_C5_u】	1.8V
19	I2C0_SDA_M2【GPIO0_D2_d】	1.8V	20	UART5_TX_M1【GPIO3_C4_u】	1.8V
21	I2C0_SCL_M2【GPIO0_D1_d】	1.8V	22	UART0_RX_M2【GPIO4_A4_d】	3.3V
23	I2C8_SDA_M2【GPIO1_D7_d】	3.3V	24	UART0_TX_M2【GPIO4_A3_d】	3.3V
25	I2C8_SCL_M2【GPIO1_D6_d】	3.3V	26	ADC4_INPUT (HP_HOOK)	1.8V
27	GND		28	ADC4_INPUT	1.8V
29	UART4_TX_M0【GPIO1_D2_d】	1.8V	30	UART3_TX_M2【GPIO4_A5_d】	3.3V
31	UART4_RX_M0【GPIO1_D3_d】	1.8V	32	UART3_RX_M2【GPIO4_A6_d】	3.3V
33	SPI0_MISO_M2【GPIO1_B1_d】	3.3V	34	SPI0_CLK_M2【GPIO1_B3_d】	3.3V
35	SPI0_MOSI_M2【GPIO1_B2_d】	3.3V	36	SPI0_CS0_M2【GPIO1_B4_u】	3.3V
37	SPEKR_P (R Output+) (2.7W/4Ω, 1.65W/8Ω)	5.0V	38	SPEKR_N (R Output-) (2.7W/4Ω, 1.65W/8Ω)	5.0V
39	SPEKL_P (L Output+) (2.7W/4Ω, 1.65W/8Ω)	5.0V	40	SPEKL_N (L Output-) (2.7W/4Ω, 1.65W/8Ω)	5.0V

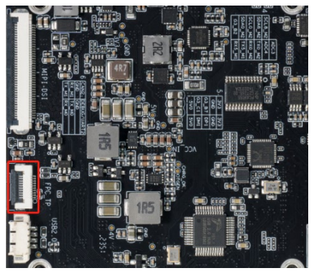
Interface definition

7. BAT 3PIN 2.0mm Pitch wafer (WHITE) (J11)



NO.	Definition	Power/V	NO.	Definition	Power/V
1	VCC_BAT (7.4V INPUT)	7.4V	3	GND	
2	BATT_TS INPUT				

8. TP 10PIN 0.5mm Pitch (J23)

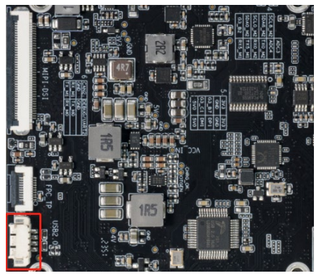


NO.	Definition	Power/V	NO.	Definition	Power/V
1	GND		6	GND	
2	GND		7	EDP_TP_INT INPUT【GPIO1_A4_d】	3.3V
3	VCC3V3_EDP (3.3V OUTPUT)	3.3V	8	EDP_TP_RESET OUTPUT【Extended IO】	3.3V
4	I2C6_SDA_M3【GPIO4_B0_d】	3.3V	9	GND	

Interface definition

5	I2C6_SCL_M3【GPIO4_B1_d】	3.3V	10	GND	

9. USB HOST 4PIN 1.25mm Pitch (J24)



NO.	Definition	Power/V	NO.	Definition	Power/V
1	VCC5V0_USB (5.0V OUTPUT)		3	HUB_HOST_DP3	-
2	HUB_HOST_DM3	-	4	GND	

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