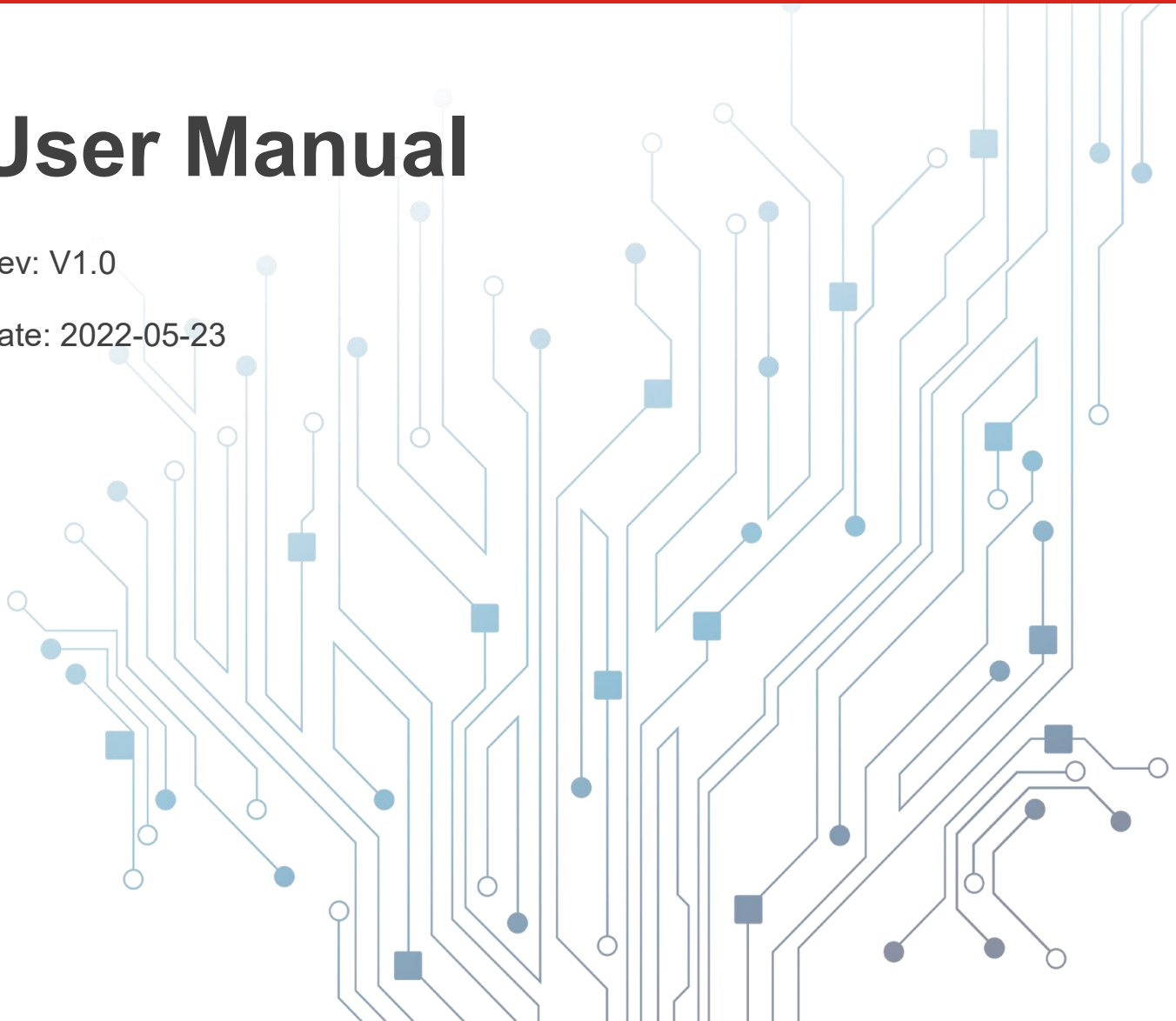Yuntion Wireless Technology (Shenzhen) Co.,Ltd.

Smart Mainboard SD5400

User Manual

Rev: V1.0

Date: 2022-05-23

History

Revision	Date	Description
V1.0	2021-05-23	● Initial

DECLARAION

CONTENT

1 Product Information

1.1. Application

SD5400 is an Android Smart Mainboard with rich control interfaces and external interfaces. It has a wide range of application scenarios in intelligent display terminals, video terminals and industrial automation terminals, such as high-end business display, intelligent self-service terminals, intelligent retail terminals, edge computing, industrial control hosts, robot devices, etc.

1.2. Overview

SD5400 adopts Rockchip RK3588 processor, which excellent processing and AI computing capability. It provides users with high-quality AI audio and video processing services in real time. The ultra-high-speed wired and wireless communication of the board greatly improves the data throughput of the system. At the same time, the board has rich HD display interfaces, which brings extraordinary visual experience to customers.

1.3. Features

SD5400 is very suitable for AI edge computing scenarios with its powerful processing ability.

➢   Powerful processing capacity:

Rockchip RK3588 processor, using the design of large and small cores, 4-core Cortex-A76 2.4GHz; 4-core Cortex-A55 1.8GHz, bringing powerful computing and processing capabilities

➢   Efficient AI computing performance: AI computing capability of up to 6TOPS

➢   Rich peripheral interfaces:

USB3.0 Super Speed communication, HDMI 4K Ultra HD display, RS232&RS485 industrial communication, RJ45 Gigabit Ethernet communication, etc.

➢   Excellent wireless communication:

5G wireless module can be connected externally and support wifi-6 wireless link.

Expansion Interface · M.2 Interface · Speaker Interface · SATA3.0 Power Port · SATA3.0 Data Interface · WL/BT_ANT · WL_ANT · BT_ANT · MIPI CSI X4 · MIPI DSI · RTC · LVDS Display Interface · EDP Display Interface · EDP Backlight Interface · LVDS Backlight Interface · HDMI Input · console Interface · type-c Interface · PCIe3.0 · USB2.0 X6 · ttyS4 · ttyS7 · DC 12V Receptacle · DC 12V · Network Interface 0 · Network Interface 1 · USB3.0 · USB3.0 · HDMI Output 0 · HDMI Output 1 · Headphone Receptacle · DIDO Interface

1.4. Appearance

Micro-SIM Interface

Micro-SD Interface

1.5. Dimension

Unit: mm
PCB Process: 8 -layer through holes, metallization
PCBA Dimension: 151.8mm*118.5mm
Mounting hole: ∮3.5mm x 4

2 Hardware Specifications

Table 1: Hardware Specifications

Hardware Specifications		
Platform	CPU	RK3588 4 Core Cortex-A76 2.4GHz 4 Core Cortex-A55 1.8GHz
	Storage(LPDDR4)	4GB standard, up to 32GB optional
	Storage (EMMC)	Standard 64GB
	Operation System	Android 12.0
Network	Mobile Network	1 M.2 Connector 4G/5G module can be connected externally
	WIFI,BT	2.4G 5G WIFI 802.11a/b/g/n/ac/ax 2T2R Bluetooth 5.2
	Ethernet	2 10M/100M/1000M Adaptive Ethernet
Communication Interfaces	USB	Default: 6 USB2.0 Pin Interface 4USB3.0 A Interface 1 Type-C Debug Interface
	RS232	1 RS232 interface
	RS485	1 RS485 interface
	PCIE3.0	1 PCIe3.0 x 4 Slot interface
	SATA3.0	1 SATA3.0 Hard Disk Data Transfer Interface
	CAN	1 CAN Interface
	DIDO	4 DIDO Interface
Video Output Interface	HDMI TX	2 HDMI2.1（8K@60fps，4K@120fps）Output One can be configured as 4K@60fps EDP Output
	LVDS	1 1080p Output
	MIPI DSI	2 MIPI DSI（4K@60fps）Output
Video Input Interface	HDMI RX	1 HDMI2.0（4k@60fps）Input, Support HDCP 2.3
	MIPI CSI	4 4 Lane MIPI CSI Input

Audio Interface	Output	1 3-segment headphone output interface
	Input	1 3-segment headphone input interface
	Speaker	2 5W/8R speaker interfaces
Card Holder	SIM Card	1.8V/3.0V, Push-Push Micro-SIM card holder
	SD Card	Push-Push Micro-SD card holder
Encode/Decode	Encode	8K@30fps H.264/H.265 Up to 16 1080p@30fps encode
	Decode	1080p@60fps MPEG-2/-1/VC-1/VP8 4K@60fps AV1 8K@30fps H.264/AVC/MVC 8K@60fps H.265/VP9/AVS2 Up to 32 1080p@30fps decode
Other Interfaces	Power Source	1 12V DC Input
	Hard Dish Power Output Port	1 12VDC/5VDC Input
	Antenna	3 WIFI/BT IPEX connector
	Extension	1 3.3V interface 1 12V interface 2 5.0V interface 1 Volume up interface 1 Volume down interface 1 Power on/off interface 1 Menu 1 ESC 1 Reset 1 BOOT 1 CAN Communication Interface 2 RS232 Communication Interface 2 SARADC_IN Interface 2 USB Data Transfer Interface

3 Interface Description

3.1. DC 12V Power Interface

SD5400 adopts DC-044B power jack and XH2.54-4P receptacle as its power input interface, the ID of DC-044B is 2.0mm, suitable for 2.0mm ID power connector plug. For the power OC protection, a 16V 3.5A PPTC is series in the power supply input.
The table below shows the pin definitions of power input interface of the board.

Table 2: Power Input XH2.54-4P Receptacle Pin Definitions

Pin No.	Name	I/O	Description	
1	GND	Ground	Ground	
2	GND	Ground	Ground	
3	12V	PI	12V DC power input	
4	12V	PI	12V DC power input	

3.2. USB Interface

SD5400 has two USB3.1 controllers and two USB2.0 controllers.The configuration of the external USB ports of the two controllers is as follows.
Two USB3.1 controllers
- 1 Type-C connector, for debugging and upgrading,
- 1 USB3.1 HUB, expand 4 USB3.0 A ports for connection of USB peripherals
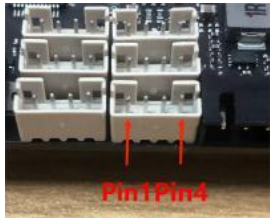
Two USB2.0 controllers
- 1 USB2.0 HUB, Expand 5 USB2.0 pin interface, the theoretical maximum power supply current is 500mA
- 1 USB2.0 pin connector

When connecting USB peripherals, there will be a voltage drop on the cable, in order to reduce the impact of voltage drop on external USB devices, USB VBUS voltage at the mainboard end is set to 5.2V, at the same time it is recommended that USB cable should not be longer than 1m.
The table below shows the pin definitions of PH2.0-4A USB connector.

Table 3：Interface Pin Definitions

Pin No.	Pin Name	I/O	Description	
1	GND	Ground	Ground	
2	DP	AI/AO	USB2.0 differential Data+	
3	DM	AI/AO	USB2.0 differential Data-	

4	VBUS	PO	5V output	

3.3. LVDS Interface

3.3.1. LVDS Display Interface

SD5400 main display port supports dual channel LVDS panel, the display resolution up to 1920x1080, the table below shows the LVDS interface pin definitions.

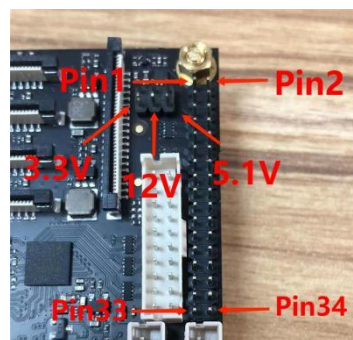**Table 3：Main Display Port LVDS Interface Pin Definitions**

Pin No.	Pin Name	I/O	Description	
1,2,3	VCC_EDP	Power	3.3V/5V/12V power	
4,5,6,13,14,25,26	GND	Ground	Ground	
7	S0D0N	AO	Odd channel data0 -	
8	S0D0P	AO	Odd channel data0 +	
9	S0D1N	AO	Odd channel data1 -	
10	S0D1P	AO	Odd channel data1 +	
11	S0D2N	AO	Odd channel data2 -	
12	S0D2P	AO	Odd channel data2 +	
15	S0CLKN	AO	Odd channel clock -	
16	S0CLKP	AO	Odd channel clock +	
17	S0D3N	AO	Odd channel data3 -	
18	S0D3P	AO	Odd channel data3 +	
19	S1D0N	AO	Even channel data0 -	
20	S1D0P	AO	Even channel data0 +	
21	S1D1N	AO	Even channel data1 -	
22	S1D1P	AO	Even channel data1 +	
23	S1D2N	AO	Even channel data2 -	
24	S1D2P	AO	Even channel data2 +	
27	S1CLKN	AO	Even channel clock -	
28	S1CLKP	AO	Even channel clock +	
29	S1D3N	AO	Even channel data3 -	
30	S1D3P	AO	Even channel data3 +	
31,32,33,34	NC	NC	Float	

3.3.2. LVDS Backlight Interface

The main display port LVDS backlight interface (PH2.0-6AW receptacle) can enable and adjust the

brightness of the LVDS LCD.

Due to the high power of LCD backlight (the 21.5-inch LVDS LCD is more than 10W), client must pay attention to the OVC protection of the backlight booster board.

Pin No.	Pin Name	I/O	Description	
1	GND	Ground	Ground	
2	GND	Ground	Ground	
3	PWM	DO	5V PWM Pulse signal	
4	EN	DO	High level 5V enable	
5	12V	Power	12V Backlight Power	
6	12V	Power	12V Backlight Power	
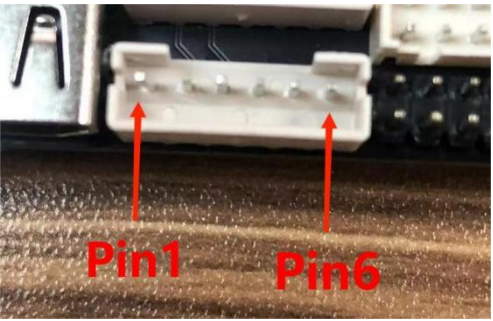
Table 4: LVDS Backlight Interface Pin Definitions
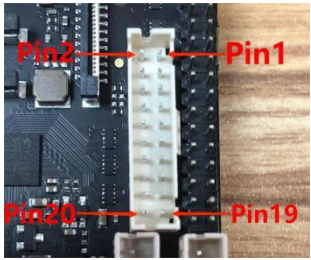
3.4. EDP Display Interface

3.4.1. EDP Display Interface

SD5400 HDMI output 0 is compatible with EDP display。

Table 5: EDP Interface Pin Definitions
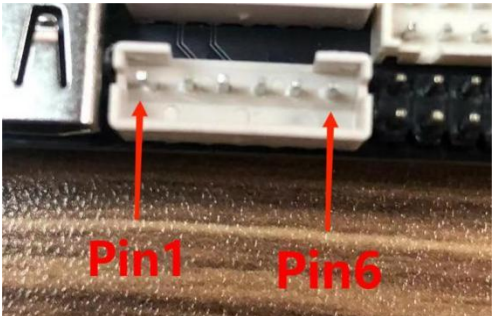
Pin No.	Pin Name	I/O	Description	
1	NC	NC	Float	
2	EDP_HPD	TBD	TBD	
3,4	GND	Ground	Ground	
5	eDP_TX_AUXN_PORT	AO	(Auxiliary Channel) Differential Data-	
6	eDP_TX_AUXP_PORT	AO	(Auxiliary Channel) Differential Data+	
7,8	GND	Ground	Ground	
9	eDP1_TX3N_PORT	AO	(Main Channel) Differential Data 3-	
10	eDP1_TX3P_PORT	AO	(Main Channel)	

11	eDP1_TX2N_PORT	AO	(Main Channel) Differential Data 2-
12	eDP1_TX2P_PORT	AO	(Main Channel) Differential Data 2+
13	eDP1_TX1N_PORT	AO	(Main Channel) Differential Data 1-
14	eDP1_TX1P_PORT	AO	(Main Channel) Differential Data 1+
15	eDP1_TX0N_PORT	AO	(Main Channel) Differential Data 0-
16	eDP1_TX0P_PORT	AO	(Main Channel) Differential Data 0+
17,18	GND	Ground	Ground
19,20	VCC_EDP	Power	3.3V/5V/12V Power
24	DVDD1.8V	Power	IO Power

(Top of table, partially visible: Differential Data 3+)

3.4.2. EDP Backlight Interface

Table 6：EDP Backlight Interface Pin Definitions

| Pin No.	Pin Name	I/O	Description
1	GND	Ground	Ground
2	GND	Ground	Ground
3	PWM	AO	5V PWM Pulse Signal
4	EN	AO	High Level 5v Enable
5	12V	Power	12V Backlight Power
6	12V	Power	12V Backlight Power

3.5. MIPI DSI Display Interface

SD5400 Auxiliary display has MIPI DSI original interface output, supports 1080p display and adopts 1mm pitch FPC receptacle.

Table 7: Auxiliary Display Port MIPI Interface Pin Definitions

Pin No.	Pin Name	I/O	Description

| 2,3,5	VCC3V3_LCD	Power	Screen Drive Power
4,7	GND	Ground	Ground
8	MIPI_DPHY0_TX_D0N	AO	Differential data 0-
9	MIPI_DPHY0_TX_D0P	AO	Differential data 0+
10	GND	Ground	Ground
11	MIPI_DPHY0_TX_D1N	AO	Differential data 1-
12	MIPI_DPHY0_TX_D1P	AO	Differential data 1+
13	GND	Ground	Ground
14	MIPI_DPHY0_TX_CLKN	AO	Differential Clock-
15	MIPI_DPHY0_TX_CLKP	AO	Differential Clock+
16	GND	Ground	Ground
17	MIPI_DPHY0_TX_D2N	AO	Differential data 2-
18	MIPI_DPHY0_TX_D2N	AO	Differential data 2+
19	GND	Ground	Ground
20	MIPI_DPHY0_TX_D3N	AO	Differential data 3-
21	MIPI_DPHY0_TX_D3P	AO	Differential data 3+
22,25,30	GND	Ground	Ground
24,26,27,28,29	TP	Test spot	Connect test pads
31,32	VCC_LED0_K_MIPI	Power	Backlight current output
1,6,23,33,34,35,36,37,38	NC	NC	Float
39,40	VCC_LED0_A_MIPI	Power	Backlight voltage input
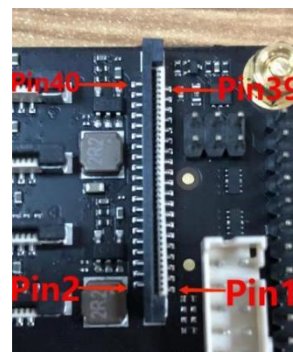
3.6. MIPI CSI Input Interface

SD5400 has 4 MIPI CSI input interfaces, and the interface definitions of the 4 cameras are exactly the same. You can connect an external MIPI camera or use a MIPI CSI adapter board to realize the HDMI input function.

Table 8: Camera Interface Pin Definitions

Pin No.	Pin Name	I/O	Description	
1	GND	Ground	Digital Signal Ground	
2	RDP0	DO	Differential Clock 0+	
3	RDN0	DO	Differential Clock 0-	
4	GND	Ground	Digital Signal Ground	
5	RDP2	DO	Differential Data 2+	
6	RDN2	DO	Differential Data 2-	
7	GND	Ground	Digital Signal Ground	
8	RDP3	DO	Differential Data 3+	
9	RDN3	DO	Differential Data 3-	
10	GND	Ground	Digital Signal Ground	
11	MCLK	DI	Sensor Clock	
12	RESET	DI	Reset	
13	XHS			
14	PWDN	DO	Power Shutdown Control	
15	FSIN/XVS			
16	VSYNC			
17	AVDD2.8V	Power	Analog Power	
18	AFVDD2.8V	Power	Focus Motor Power	
19	GND	Ground	Digital Signal Ground	
20	I2C_SCL	DI	I2C Clock	
21	I2C_SDA	DI/DO	I2C Data	
22	DVDD	Power	1.2V Digital Core Power	
23	GND	Ground	Digital Signal Ground	
24	DVDD1.8V	Power	IO Power	
25	GND	Ground	Digital Signal Ground	
26	RDN1	DO	Differential Data 1-	
27	RDP1	DO	Differential Data 1+	
28	GND	Ground	Analog	
29	RCP	DI	Differential Clock+	
30	RCN	DI	Differential Clock-	
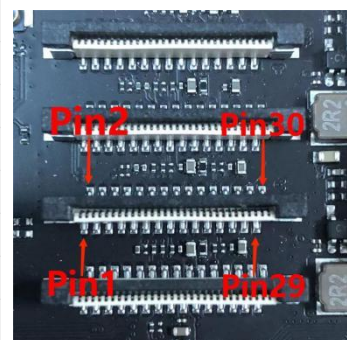
3.7. Console Interface

SD5400 has a console configuration interface.

Table 9: Console Configuration Interface Pin Definitions

Pin No.	Pin Name	I/O	Description

3	TX	DO	Debug Data Send	
6	RX	DI	Debug Data Receive	
1,2,4,5,7,8	NC	NC	Float	

3.8. RS232 & RS485 Interface

SD5400 has 4 RS232 interface(two of them are included in the IO expansion interface) and one RS485 interface.

3 RS232 interface is defined in software as ttyS7, ttyS6, ttyS3 and ttyS4.

ttyS7 adopts XH-4AW interface, the highest communication rate is 115200bps, ttyS7 pin definition see Table 11.

ttyS4 interface is connected to the RS485 through the jumper resistor. The interface pins are shown in Table 12.

ttyS6,ttyS3 pin definition see Table 16: Extended interface pin definition.

RS485 interface is named ttyS4 in software and adopts XH-4AW interface. RS485 interface can be configured as RS232 by hardware,

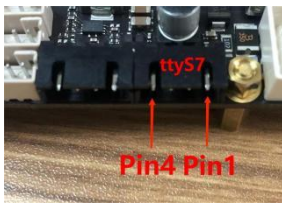**Table 10: RS232（ttyS7） Interface Pin Definitions**
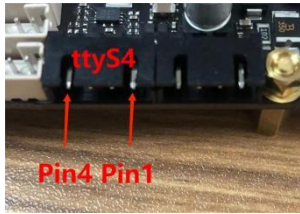
Pin No.	Pin Name	I/O	Description	
1	GND	Ground	Ground	
2	RS232-RX	DI	RS232 receiver input	
3	RS232-TX	DO	RS232 driver output	
4	5V	PO	5V power output	

Table 11：RS485（ttyS4）Interface Pin Definitions
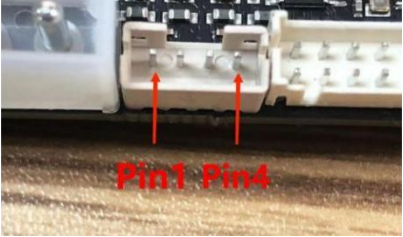
Pin No.	Pin Name	I/O	Description	
1	GND	Ground	Ground	
2	A RS232-RX	DI/DO DI	RS485 Data A RS232 Receiver Input	
3	B RS232-TX	DI/DO	RS485 Data B RS232 Driver Output	
4	5V	PO	5V Power Output	

3.9. Speaker Interface

SD5400 supports dual 5W/8R speaker output, and the interface model is PH2.0-4A.

Table 12: Speaker Interface Pin Definition

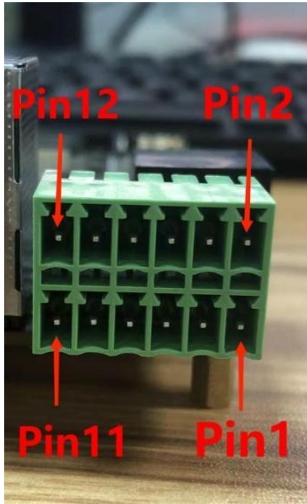| Pin No.	Pin Name	I/O	Description	
1	SPKLP	AO	Left Channel Output +	
2	SPKLN	AO	Left Channel Output -	
3	SPKRP	AO	Right Channel Output +	
4	SPKRN	AO	Right Channel Output -	

3.10. DIDO Communication Interface

SD5400 supports 4 DIDO communication, using 3.5mm pitch double-layer package terminals to lead out

Table 13: DIDO communication interface pin definition

| Pin No.	Pin Name	I/O	Description	
1	GND	Ground	Ground	
2	COM_12V	power	12V Output	
3	DI1	DI	Digital Signal Input 1	
4	DO1	DO	Digital Signal Output 1	
5	DI2	DI	Digital Signal Input 2	
6	DO2	DO	Digital Signal Output 2	
7	DI3	DI	Digital Signal Input 3	
8	DO3	DO	Digital Signal Output 3	
9	DI4	DI	Digital Signal Input 4	
10	DO4	DO	Digital Signal Output 4	
11	CAN1L	DO	CAN Communication Differential Low-Order Dat 1	
12	CAN1H	DO	CAN Communication	

			Differential High-Order Data 1	

3.11. Expansion Interface

In order to enrich peripheral interfaces, the mainboard has one expansion interface. The following table is the pin definitions.

Table 14: Expansion Interface Pin Definitions

Pin No.	Pin Name	I/O	Description	
1	VCC_3V3_S3	PO	3.3V Output	
2	5V0	PO	5.1V Output	
3	V+	DI	Volume Up Low Level Effective	
4	VCC12V_DCIN	PO	External 12V Power Input	
5	V-	DI	Volume Down Low Level Effective	
6	GND	Ground	Ground	
7	MENU	DI	open Menu Low Level Effective	
8	GND	Ground	Ground	
9	ESC	DI	Cancel Operation Low Level Effective	
10	ttyS_TX3	DO	RS232（ttyS3）Data Send	
11	RESET	DI	Reset Low Level Effective	
12	ttyS_RX3	DI	RS232（ttyS3）Data Receive	
13	PWRON	DI	Boot Signal Low Level Effective	
14	ttyS_TX1	DI	RS232（ttyS1）Data Send	
15	GND	Ground	Ground	
16	ttyS_RX1	DI	RS232（ttyS1）Data Receive	
17	BOOT	DI	BOOT Low Level Effective	
18	MIC2N	DI	MIC Data 2-	
19	PWM12_M1_FAN	DO	PWM Modulation Signal	
20	MIC2P	DI	MIC data 2+	
21	CAN0H	DO	CAN Communication Differential High-Order Data 0	
22	SARADC_IN6	DI	Digital-to-analog Conversion	
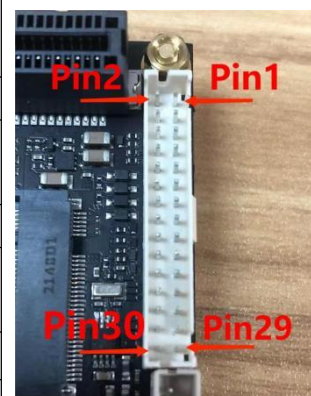
			Input Port 6
23	CAN0L	DO	CAN Communication differential low-order data 0
24	SARADC_IN7	DI	Digital-to-analog conversion input port 7
25	DP7	DO	USB2.0 Differential data 7+
26	DM7	DO	USB2.0 Differential data 7-
27	DP6	DO	USB2.0 Differential data 6+
28	DM6	DO	USB2.0 Differential data 6-
29	VCC_5V0	PO	5.1V Output
30	GND	Ground	Ground

3.12. Other Standard Interface

Table 15: Other Standard Interface

Interface	Attribute	Description
Extended Storage Interface	Micro-SD Standard interface	Data Storage
4G/5G Interface	M.2-B Standard interface	M.2 receptacle, 4G/5G module with external M.2 interface
SIM Card Interface	Micro-SIM Standard interface	1.8V/3V Micro-SIM card holder
HDMI Interface	HDMI Standard interface	2 HDMI output and 1 HDMI input Cannot be used with Type-C interface at the same time
Ethernet Port	RJ45 Standard network port	Gigabit Ethernet interface Cannot be used with Type-C interface at the same time
Headphone Input	3.5mm 3-segment	
Headphone Output	3.5mm 3-segment	
Hard Disk Data Interface	SATA_7P Female Standard Interface	SATA3.0 Hard Disk Data Transfer
IDE Power Interface	Hard Disk Power	5.08mm Pitch Large 4p Hard Disk Power Interface
PCIe3.0 Interface	PCIe3.0 x 4 Slot Serial Standard Interface	PCIe3.0 Communication
RTC Interface	CR1220-3V Coin Battery	RTC Power Supply

	Standard Interface	
Type-C Interface	Type-C Standard Interface	Data Transfer
USB3.0 Interface	USB3.0 Standard Interface	Data Transfer

4 Electrical Parameters

Table 16: Electrical Parameters

Item		Min	Typ.	Max	Note
Power Consumption	Voltage	--	--	--	
	Current	--	--	--	
Temperature	Relative Humidity	--	--	--	
	Operating Temperature	--	--	--	
	Storage Temperature	--	--	--	