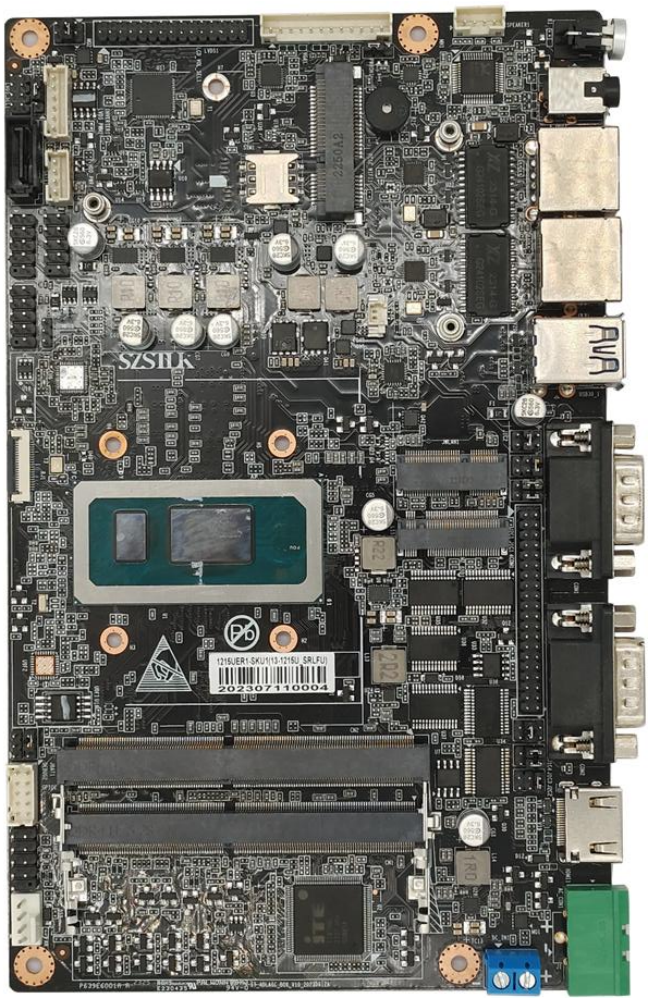
Intel® Core™ ALDER LAKE
Motherboard Specifications



Chapter 1: Product Overview

1.1 Product Overview

This product features the Intel® Core™ 12th Generation Alder Lake processor, integrated with Intel® UHD Graphics GPU. It supports multiple display interfaces, including HDMI, LVDS, and VGA, enabling triple-screen independent or mirrored display functionality. It offers support for ultra-high-definition 4K video decoding and playback at a maximum resolution of 4096x2160. Compatible with the latest Windows 10, Windows 11, and Linux operating systems, this motherboard provides versatile peripheral hardware interfaces, making it widely applicable in intelligent control fields such as digital signage, all-in-one PCs, medical devices, security, industrial control, transportation, finance, and consumer electronics.

1.2 Key Features

1. **High Performance:**

   The motherboard utilizes advanced processors with six cores and eight threads or ten cores and twelve threads, built using a cutting-edge 10nm manufacturing process. These are among the most powerful processors available on the market. Compared to common dual-core and quad-core solutions, this industrial control motherboard offers a significant leap in performance. It can handle complex interactive operations, support diverse applications, and ensure seamless compatibility. Additionally, it excels at playing high-definition videos.

2. **Superior Stability:**

   This industrial control motherboard is equipped with proprietary technologies to ensure hardware and software stability. Its circuit design incorporates enhanced protective measures, and it uses premium-grade components from reputable brands. The result is exceptional reliability and safety, supporting uninterrupted 24/7 operation without human intervention.

3. **High Integration:**

   The motherboard integrates HDMI, LVDS, and VGA outputs, dual Gigabit Ethernet ports, audio/speaker support, and DDR4 3200MHz memory (up to the highest standard). It also supports NVMe SSDs, 4G expansion modules, Wi-Fi and Bluetooth modules, encryption modules, diskless boot, network wake-up, auto power-on, and watchdog functionality. Its standard 195x120mm design ensures a well-organized and aesthetically pleasing layout while enhancing overall system performance and usability.

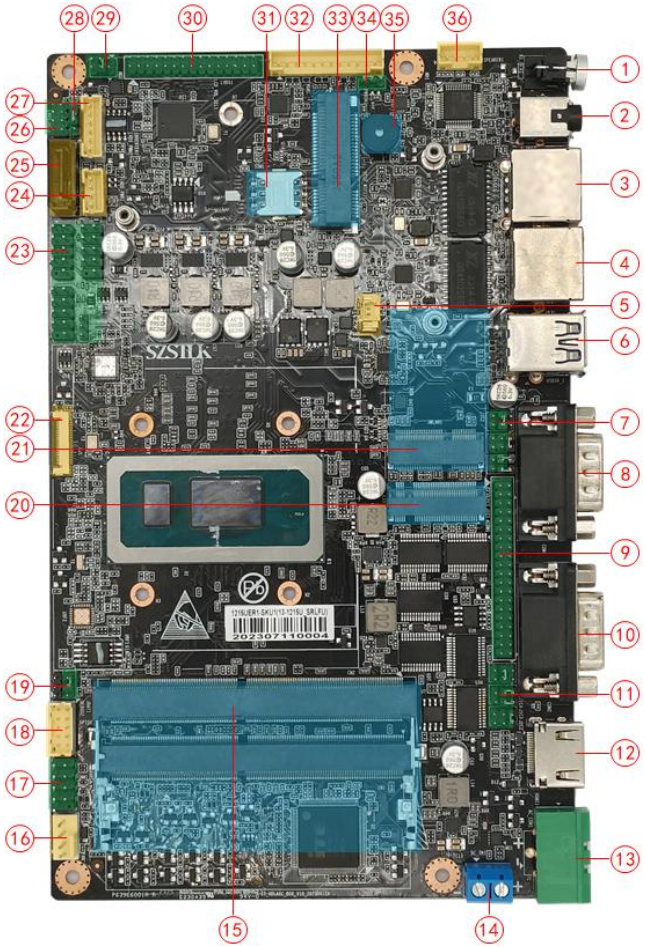
4. **Exceptional Expandability:**

   The motherboard offers extensive serial port and I/O expansion capabilities, including one dual-layer USB 3.0 Type-A interface, six USB 2.0 pin headers, eight GPIOs, and six COM232 ports (two RS232/485, with optional 5V/12V on pin 9). These features allow the integration of additional peripherals to meet diverse application requirements

effectively.

Chapter 2: Product Specifications

2.1 Product Specification Diagrams



No.	Interface Name		No.	Interface Name		No.	Interface Name
1	Power Button		13	2-Pin Phoenix Power Connector		25	SATA Connector
2	Audio Combo Jack		14	2-Pin Phoenix Side Power Connector		26	LVDS Resolution Selection Pins
3	LAN1 (RJ45)		15	Dual DDR4 Slots		27	Backlight Power Connector
4	LAN2 (RJ45)		16	CPU Fan Header		28	High/Low Brightness Toggle Pins
5	RTC Connector		17	Power/Reset Pins		29	LVDS Voltage Selection Pins
6	USB 3.0 x2		18	GPIO Header		30	LVDS Header
7	COM1 (RS232 to RS485) Header		19	Clear BIOS Pins		31	SIM Card Slot
8	COM1 Port		20	SSD/M.2 Slot		32	VGA External Connector

9	COM3-COM6 Headers (RS232)		21	Wi-Fi/BT/M.2 Slot		33	4G Module Slot
10	COM2 Port		22	PCI-E 0.5-Pitch Connector		34	Auto-Power-On/Manual Jumper
11	COM2 (RS232 to RS485) Header		23	USB 2.0 x6 Header		35	Buzzer
12	HDMI		24	HDD Power Connector		36	SPEAK Connector

Back Panel I/O Ports Overview

Version A (Dual LAN + Phoenix Connector Edition)

① **Phoenix Power Connector**

This port supports a 12V adapter. Note: This connector cannot be used simultaneously with the 2-pin Phoenix side power connector for power input.

② **HDMI Display Interface**

This port supports resolutions up to 4096x2160@60Hz (actual supported resolution may vary depending on the display device)

③ **COM2 Interface**

This port supports standard 9-pin DB9 RS-232 serial communication and 9-pin RS-485 half-duplex communication.

④ **COM1 Interface**

This port supports standard 9-pin DB9 RS-232 serial communication and 9-pin RS-485 half-duplex communication.

⑤ **USB3.0 Port**

This interface supports USB 3.0 standards and is backward compatible with USB 2.0/1.1. The default current limit is 2.0A, suitable for high-power peripherals such as printers.

⑥ **Network Port**

Gigabit Ethernet port with configurable speed options, including 100 Mbps and 10 Mbps.

⑦ **Network Port**

Gigabit Ethernet port with configurable speed options, including 100 Mbps and 10 Mbps.

⑧ **Audio Combo Jack (Black)**

This port combines 4-pole headphone audio output and microphone input. It can be used for both headphone audio output and headset microphone input.

⑨ **Power Button**

This port serves as an onboard power on/off control button.

B 版单网口+DC 座版本

① Phoenix Power Connector

This port supports a 12V adapter. Note: This connector cannot be used simultaneously with the 2-pin Phoenix side power connector for power input.

② HDMI Display Interface

This port supports resolutions up to 4096x2160@60Hz (actual supported resolution may vary depending on the display device)

③ COM2 Interface

This port supports standard 9-pin DB9 RS-232 serial communication and 9-pin RS-485 half-duplex communication.

④ COM1 Interface

This port supports standard 9-pin DB9 RS-232 serial communication and 9-pin RS-485 half-duplex communication.

⑤ USB3.0 Port

This interface supports USB 3.0 standards and is backward compatible with USB 2.0/1.1. The default current limit is 2.0A, suitable for high-power peripherals such as printers.

⑥ Network Port

Gigabit Ethernet port with configurable speed options, including 100 Mbps and 10 Mbps.

⑦ USB 2.0 Connection Port

This port complies with USB 3.0 specifications and supports high-current peripherals such as printers.

⑧ Audio Combo Jack (Black)

This port combines 4-pole headphone audio output and microphone input. It can be used for both headphone audio output and headset microphone input.

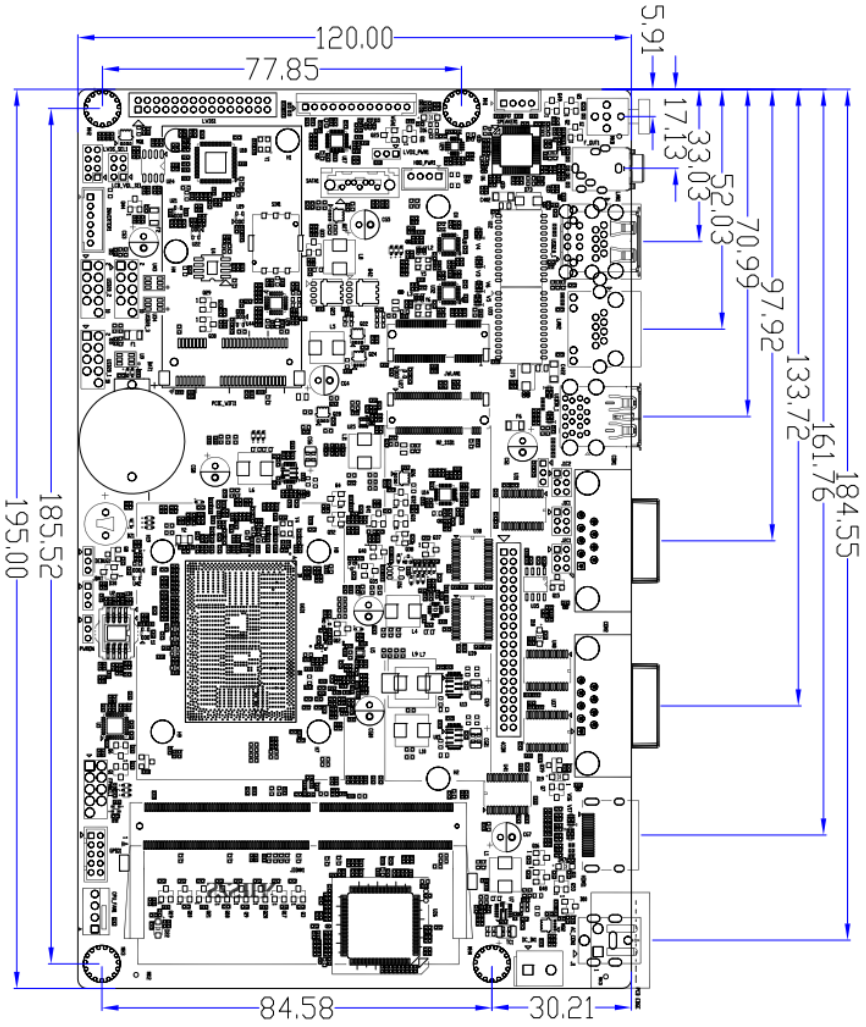
⑨ Power Button

This port serves as an onboard power on/off control button.

2.2 Hardware Specifications:

CPU	Integrated Intel® Core® Alder Lake Processor
Memory	1x SODIMM slot (supports DDR4 3200, up to 64GB)
Storage	Supports NVMe SSD and SATA
Display	Integrated Intel® UHD Graphics Supports HDMI, LVDS, and VGA, with a maximum resolution of 4096x2160 @ 60Hz
IO Ports	2x USB 3.0, 1x HDMI, 2x RJ45 (Gigabit Ethernet), 2x COM ports (COM1 and COM2 support RS232 and RS485), 1x Combo audio jack
Internal I/O	1x SATA slot 1x M.2 Key-M slot 1x M.2 Key-E slot 1x Mini-PCIe 4G slot 2x SO-DIMM DDR4 slots 6x onboard USB 2.0 headers 4x onboard COM headers (COM3 – COM6, RS232) 1x GPIO header 1x onboard VGA header 1x LVDS header 1x speaker header 1x front panel (F_PANEL) header 1x 4-pin fan header 1x inverter header
Power	12V/7A via 2-pin Phoenix connector or side-insert 2-pin Phoenix connector
Operating Environment	Operating temperature/humidity: -5°C to 60°C, 10% to 90% non-condensing Storage temperature/humidity: -20°C to 75°C, 5% to 95% non-condensing
Watchdog Timer	255 levels, programmable in seconds/minutes, supports timeout interrupts or system reset
BIOS	AMI UEFI BIOS
Operating Systems	Supports Windows 10/11 and Linux
Dimensions	195mm ×120mm

2.3 CAD Dimensions



(This image is for reference only. Please refer to the actual product.)

2.4、Slots

2.4.1、Memory Slot

Supports dual-slot DDR4-3200, LPDDR4-3733 with 144-pin and 200-pin interfaces, up to 64GB of memory. Horizontal installation method.

2.4.2 Serial ATA Connector

Supports connection to Serial ATA hard drives or other Serial ATA compliant devices using Serial ATA cables.

2.4.3、Mini PCIe Slot

Mini PCIe supports 4G modules. When installing the card, insert it at a 30-degree angle, then press down until it reaches the screw post and secure it with a screw.

2.4.4、M.2 Slots

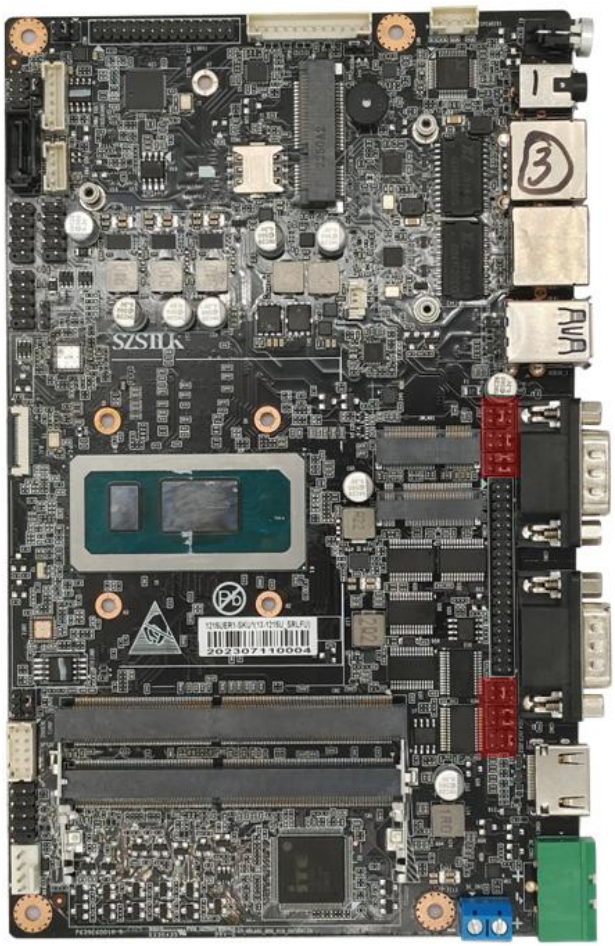
M.2 Slots

The M.2_1 slot supports Wi-Fi/Bluetooth modules. The M.2_2 slot supports NVMe SSDs.

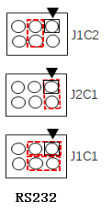
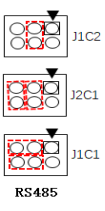
When installing, please insert the card at a 30-degree angle, then press down until it reaches the screw post and secure it with a screw.

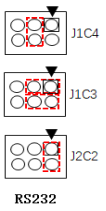
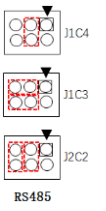
2.5、Jumper Settings:

2.5.1、COM1 485/232 Protocol Jumper Configuration:



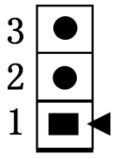
The functions of COM1 and COM2 ports vary depending on the jumper cap combination. Please refer to the table below for details.

COM1			
RS232		**RS485**	
Diagram	Settings	Settings	Diagram
	J1C2(3-4)	J1C2(3-4)	
	J2C1(1-2)	J2C1(3-4)	
	J1C1(1-3)	J2C1(5-6)	
	J1C1(2-4)	J1C1(3-5)	
		J1C1(4-6)	

COM2			
RS232		**RS485**	
Diagram	**Settings**	**Settings**	Diagram
	J1C4(3-4)	J1C4(3-4)	
	J1C3(1-3)	J1C3(3-5)	
	J1C3(2-4)	J1C3(4-6)	
	J2C2(1-2)	J2C2(3-4)	
		J2C2(5-6)	

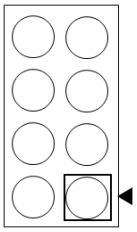
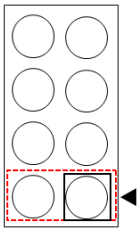
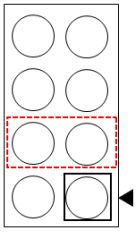
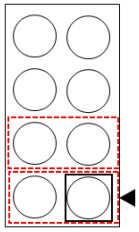
2.5.2、LVDS Jumper Settings：

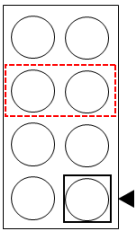
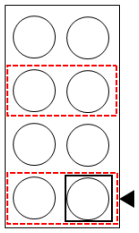
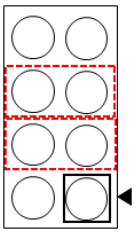
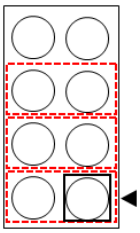
LVDS Display Brightness Jumper Settings(Chinese: 显示器高亮/低亮跳针):

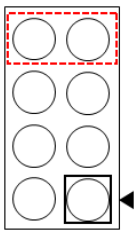
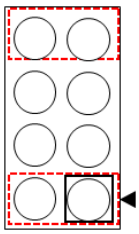
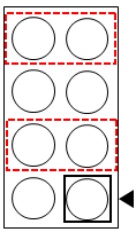
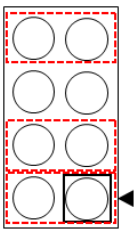
Diagram	Pin	Pin Definition
	1	BKLT_PWM_N
	2	BKLT_PWM1
	3	LVDS_BKLT_PWM

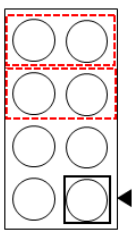
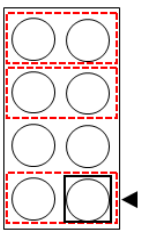
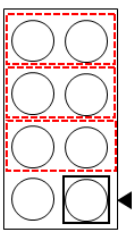
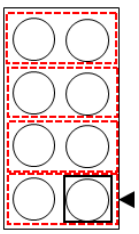
Note: Default Jumper Setting is 2-3 PIN
LVDS Brightness Inversion Jumper
When adjusting the brightness of the LVDS display in the system,
dragging the brightness slider will cause the LVDS brightness to increase or decrease in the opposite direction of the slider progress.

Resolution Selection Jumper Settings(Chinese: 分辨率跳针):

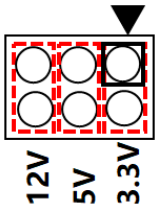
Resolution	800*600 Single 6	1024*768 Single 6	1024*768 Single 8	1280*768 Single 6
Pin	**0.0.0.0**	**1.0.0.0**	**0.1.0.0**	**1.1.0.0**
Diagram				

Resolution	1280*800 Single 6	1280*960 Single 6	1280*1024 Double 8	1366*768 Single 6
Pin	**0.0.1.0**	**1.0.1.0**	**0.1.1.0**	**1.1.1.0**
Diagram				

Resolution	1366*768 Single 8	1440*900 Double 8	1400*1050 Double 8	1600*900 Double 8
Pin	**0.0.0.1**	**1.0.0.1**	**0.1.0.1**	**1.1.0.1**
Diagram				

Resolution	1680*1050 Double 8	1600*1200 Double 8	1920*1080 Double 8	1920*1200 Double 8
Pin	**0.0.1.1**	**1.0.1.1**	**0.1.1.1**	**1.1.1.1**
Diagram				

Display Voltage Selection Jumper Settings（Chinese: 显示器电压跳针）:

Pin	Definition	Diagram
1-2	VCC3 3.3V	
3-4	VCC5 5V	
5-6	12V	

⚠ WARNING! WARNING! WARNING! ⚠

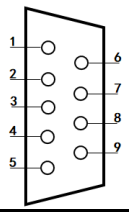
(PLEASE CAREFULLY READ AND VERIFY THE RELEVANT DOCUMENTATION BEFORE CONFIGURING THE JUMPERS. INCORRECT OPERATIONS MAY RESULT IN DISPLAY DAMAGE OR BURNOUT

2.6、Interface Definitions:

On the PCBA, each PIN is marked, with the indicator ▶ pointing to PIN.

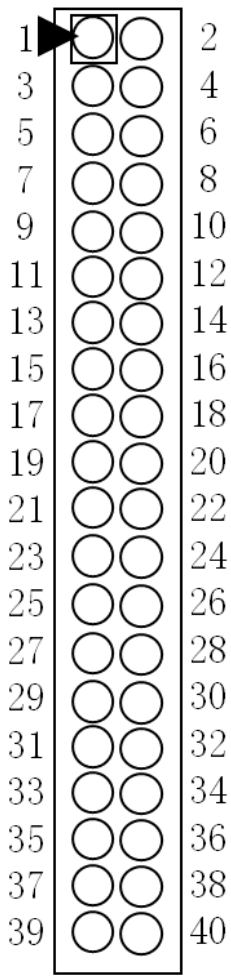
For detailed definitions of each PIN, please refer to the following information

2.6.1、COM1- COM2:

Diagram	Pin	Pin Definition	Pin	Pin Definition
	1	COM_DCD_CN	6	COM_DSR_CN
	2	COM_RXD_CN	7	COM_RTS_CN
	3	COM_TXD_CN	8	COM_CTS_CN
	4	COM_DTR_CN	9	COM_RI_CN
	5	GND		NC

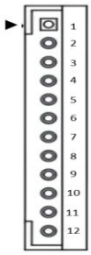
2.6.2、COM3-COM6:

Diagram	Pin	Pin Definition	Pin	Pin Definition
	1	COM3_DCD_CN	2	COM3_RXD_CN
	3	COM3_TXD_CN	4	COM3_DTR_CN
	5	GND	6	COM3_DSR_CN
	7	COM3_RTS_CN	8	COM3_CTS_CN
	9	COM3_RI_CN	10	GND
	11	COM4_DCD_CN	12	COM4_RXD_CN
	13	COM4_TXD_CN	14	COM4_DTR_CN

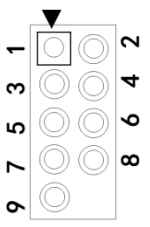


15	GND	16	COM4_DSR_CN
17	COM4_RTS_CN	18	COM4_CTS_CN
19	COM4_RI_CN	20	GND
21	COM5_DCD_CN	22	COM5_RXD_CN
23	COM5_TXD_CN	24	COM5_DTR_CN
25	GND	26	COM5_DSR_CN
27	COM5_RTS_CN	28	COM5_CTS_CN
29	COM5_RI_CN	30	GND
31	COM6_DCD_CN	32	COM6_RXD_CN
33	COM6_TXD_CN	34	COM6_DTR_CN
35	GND	36	COM6_DSR_CN
37	COM6_RTS_CN	38	COM6_CTS_CN
39	COM6_RI_CN	40	GND

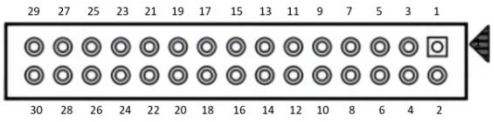
2.6.3、VGA1：

Diagram	Pin	Pin Definition	Pin	Pin Definition
	1	GND	2	VSOUT
	3	HSOUT	4	GND
	5	VGA_R+	6	GND
	7	VGA_G+	8	GND
	9	VGA_B+	10	GND
	11	VGA_DDCSDA	12	VGA_DDCSCL

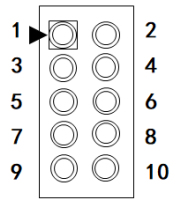
2.6.4、F_PANEL：

Diagram	Pin	Pin Definition	Pin	Pin Definition
	1	HDLED+	2	PWRLED+
	3	HDLED-	4	GND
	5	GND	6	PWRSW_N
	7	RESET_BTN	8	GND
	9	NC	10	NC

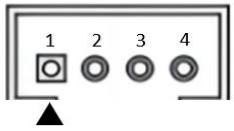
2.6.5、LVDS：

Pin	Pin Definition	Pin	Pin Definition
1	LCDVDD	2	LCDVDD
3	LCDVDD	4	GND
5	LVDS_DECT	6	GND
7	LVDS_A0_DN	8	LVDS_A0_DP
9	LVDS_A1_DN	10	LVDS_A1_DP
11	LVDS_A2_DN	12	LVDS_A2_DP
13	GND	14	GND
15	LVDS_ACLK_DN	16	LVDS_ACLK_DP
17	LVDS_A3_DN	18	LVDS_A3_DP
19	LVDS_B0_DN	20	LVDS_B0_DP
21	LVDS_B1_DN	22	LVDS_B1_DP
23	LVDS_B2_DN	24	LVDS_B2_DP
25	GND	26	GND
27	LVDS_BCLK_DN	28	LVDS_BCLK_DP
29	LVDS_B3_DN	30	LVDS_B3_DP
			

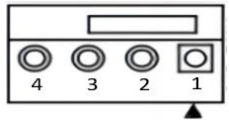
2.6.6、GPIO：

Diagram	Pin	Pin Definition	Pin	Pin Definition
	1	GPIO_C_1	2	GPIO_C_2
	3	GPIO_C_3	4	GPIO_C_4
	5	GPIO_C_5	6	GPIO_C_6
	7	GPIO_C_7	8	GPIO_C_8
	9	VCC_GPIO 5V	10	GND

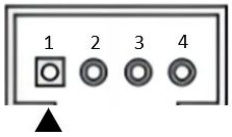
2.6.7、SPEAKERS:

Diagram	Pin	Pin Definition
	1	SPKR_RN_CONN
	2	SPKR_RP_CONN
	3	SPKR_LN_CONN
	4	SPKR_LP_CONN

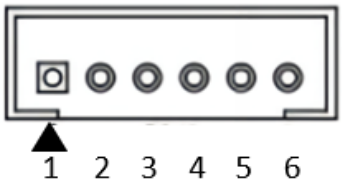
2.6.8、CPU_FAN:

Diagram	Pin	Pin Definition
	1	GND
	2	12V
	3	FAN_TACH
	4	FAN_PWM

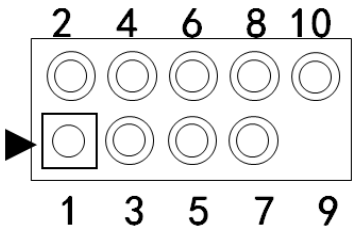
2.6.9、HDD_PWR

Diagram	Pin	Pin Definition
	1	12V
	2	GND
	3	GND
	4	5V

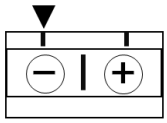
2.6.10、 INVERTER Interface

Diagram	Pin	Pin Definition
	1	12V
	2	12V
	3	BKLT_ON
	4	LVDS_BKLT_PWM
	5	GND
	6	GND

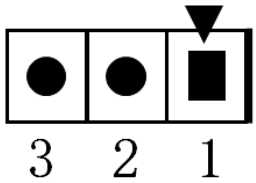
2.6.11、USB1-3 Interface

Diagram	Pin	Pin Definition
	1	+V5P0A_USB_P3
	2	+V5P0A_USB_P3
	3	USB_HEADER_DN
	4	USB_HEADER_DN
	5	USB_HEADER_DP
	6	USB_HEADER_DP
	7	GND
	8	GND
	9	NC
	10	GND

2.6.12、DC_IN2 Phoenix Terminal

Diagram	Pin	Pin Definition
	1	GND
	2	12V

2.6.13、PWR ON1 (Power On: Manual or Automatic)

Diagram	Pin	Pin Definition
 **1-2 PIN:** Auto Power on **2-3 PIN:** Manual Power on	1	PWRSW_N
	2	AUTO_BUTTON_N
	3	NG

In accordance with the requirements of the GB/T 26572 standard established by the "Administrative Measures for the Control of Pollution Caused by Electronic Information Products" issued by the Ministry of Information Industry of the People's Republic of China, the pollution control label and the identification of hazardous or toxic substances or elements for this product are as follows:

Product Identification for Hazardous or Toxic Substances or Elements:

Names and Content of Hazardous or Toxic Substances or Elements in the Product

Part	Hazardous or Toxic Substances or Elements					
	Pb	Hg	Cd	cr(v)	PBB	PBDE
PCB Board	X	O	O	O	O	O
Structural Components	O	O	O	O	O	O
Chips	O	O	O	O	O	O
Connectors	O	O	O	O	O	O
Passive Electronic Components	X	O	O	O	O	O
Soldering Metals	X	O	O	O	O	O
Wires	O	O	O	O	O	O
Other Consumables	O	O	O	O	O	O

O: Indicates that the content of the hazardous or toxic substance in all homogeneous materials of the component is within the limits specified by the GB/T 26572 standard.

X: Indicates that the content of the hazardous or toxic substance exceeds the limits specified by the GB/T 26572 standard in at least one homogeneous material of the component.

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Important Reminder

Please pay special attention to the power supply requirements for the motherboard. Our motherboards require a DC 12V power supply with ripple noise less than 100mV. When selecting a power supply, ensure that the power surge voltage (P-P value) does not exceed 12V. If the power supply voltage or surge exceeds the motherboard's supported range of 12V, it may result in permanent damage, such as burning or circuit failure. Ripple noise exceeding 100mV can cause interference or instability in the motherboard's operation, especially affecting sensors and touch screens, leading to issues like erratic behavior. We recommend using a 12V/3A power supply, or a 12V/5A power supply if multiple peripheral devices are connected.

Before powering the motherboard, ensure that:

- The power supply voltage is within the specified range.
- The power wiring is correctly connected.
- The display cable and voltage jumpers are properly configured.
- All connectors and pins are correctly connected.

Only power on the motherboard after verifying that all power voltages and connections are accurate.