

# DJ-A133 Commercial Display Smart Motherboard

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## INSTRUCTION

Version: V1.0

Date: 2023-5-18

## Statement

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The product specifications and information mentioned in this manual are for reference only, and are subject to change without notice. Unless otherwise agreed, this manual is used only as a guide, and the statements made do not constitute any type of guarantee.

## Preface

This manual is intended to help users to use the product correctly. In which contains the descriptions of product performance characteristics as well as the detailed explanation of the configuration. Please read this manual carefully before proceeding. The company will be exempt from liability for damage to the motherboard or peripherals caused by improper personal operation.

### Warm Reminder

- Please read this manual carefully before proceeding.
- Please keep the unused boards in anti-static protection bag.
- Before taking the motherboard from the package, place the hand first on the grounded metal object for a while to release the static electricity from the body and hands.
- Avoid touching the device on the board directly with your hand while holding the board.
- Before operating, the motherboard should be placed on a solid surface.
- Please keep the motherboard dry. The heat sink slot is for ventilation and to avoid overheating of the components inside the chassis. Do not cover or block such openings.
- Before connecting the motherboard to the power supply, please check the power supply voltage.
- Position the power cord where it will not be trampled, and do not pile anything on it.
- Before connecting or disconnecting any equipment, be sure that all power cords have been unplugged.
- To prevent the human body from being electrocuted or the product being damaged, please turn off the AC power or unplug the AC power cord from the power outlet each time you unplug or reconfigure the whole machine or board.
- Pay attention to all the cautions and warnings mentioned in the manual.
- To avoid unnecessary damage to the product caused by frequent switching on and off, after power off, wait for at least 30 seconds for turning on again.
- Any abnormal situation occurs in working, please turn to professional staff for help.

- Please do not place or store this equipment at a ambient temperature higher than 60 °C, it will harm to the equipment.

**Caution:** There will be a risk of explosion if battery is incorrectly replaced. Be sure to use the same or similar type of battery recommended by the manufacturer.

## Technical support and service

- Technical Support Scope:

Item	Description
1	Provide the pre-sales consulting for the software and hardware
2	Provide the technical support for problems appears in operating the software and hardware
3	Provide the after-sales technical support for OEM、ODM
4	Provide the maintenance service for products within the warranty period

- Technical Support Mailbox:

ces\_support@ces-tech.com

- Technical Support Service Hours:

Monday to Friday: 9:00 ~ 12:00, 13:30 ~ 18:00 (Except for national holidays)

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# Chapter 1 Product Introduction

## 1.1 Motherboard Introduction

The DJ-A133 commercial display smart motherboard is designed with ultra-thin motherboard specifications and is a high-performance and cost-effective commercial display automatic terminal motherboard. Based on Allwinner 64-bit Cortex™-A53 quad-core processor A133, frequency up to 1.5GHz, Internally integrated PowerVR GE8300 GPU, perfectly support for 4K@30fps video hardware decoding. This motherboard integrates multimedia decoding, LCD driver, Gigabit Ethernet, WIFI6, BT5.2, AUDIO, UART, USB, GPIO, RTC and other functions, supporting many peripheral expansion.

DJ-A133 motherboard adopts the structure of core board and base board, which is beneficial for customers to quickly develop their final products. Customers can either directly use the motherboard as a product, or use the core board, and customize base board as their final products. All components of the core board are domestically produced, with a localization rate of 100%.

DJ-A133 motherboard has advantages such as stable and reliable product performance, high cost-effectiveness, and low power consumption. Equipped with Android and Linux software operating systems. It can be widely used in media player, digital signage, interactive advertising machine, large LCD Screen, communication control, medical equipment, industrial control, traffic control, information system, financial equipment, automotive, digital control and various terminal markets.

## 1.2 Motherboard Feature

- Ultra-thin motherboard with excellent stability and reliability, size: 88mm\*118mm.
- Based on Allwinner 64-bit Cortex™-A53 quad-core processor A133, frequency up to 1.5GHz, integrated PowerVR GE8300 GPU, perfectly support for 4K@30fps video hardware decoding.
- Dual channel LVDS interface with up to 1920 resolution\* 1200@60fps, compatible with single 8 and dual 8 LVDS interfaces. Optional RGB (1280\* 720@60fps) or MIPI DSI (1920\* 1200@60fps) interface.
- Gigabit Ethernet RJ45 interface, supporting 10M/100M/1000M adaptive.
- Rich industry application peripheral interfaces, such as UART, USB, GPIO, I2C and etc.
- Built in WIFI6/BT5.2 combo module, supporting WIFI6, supporting 2.4GHz and 5.0GHz WIFI, supporting 802.11 a/b/g/n//ac/ax, supporting BT 5.2 Bluetooth communication (Bluetooth V5.2 of 1, 2 and 3 Mbps).
- Built-in MINI PCIe 4G interface with SIM card slot, supporting various MINI PCIe 4G

modules.

- Perfect support for Android and Linux operating systems, providing API DEMO code and supporting customers in developing application software.

## 1.3 Motherboard Specification

DJ-A133 motherboard includes a core board and a base board, and their specification list is as follows:

### 1.3.1 Core Board Specification

DJ-A133 core board is designed with high TG HDI, compatible with A133 and A133P. It integrates CPU, LPDDR4, eMMC, PMU, WIFI6/BT5.2 module. It is connected to the base board through SMT. The core board has the advantages of high reliability and low cost, with a size of only 40mm\*55mm. Its design meets the design needs of various industries. We can provide A133/A133P core board with different configurations according to customer needs, and also provide customized services according to customer needs.

The detailed specification list of the core board is as follows:

SOC	
CPU	Allwinner A133, 64-bit Cortex™-A53 quad-core processor, frequency up to 1.5GHz. Optional A133P
GPU	PowerVR GE8300 GPU, support for 4K@30fps video hardware decoding
Storage	
RAM	Standard configuration 2GB LPDDR4.Optional 1GB/3GB/4GB LPDDR4
ROM	Standard configuration 16GB eMMC 5.1.Optional 8GB/32GB/64GB...
WIFI/BT	
WIFI/BT	Built in WIFI6/BT5.2 combo module, supporting 2.4GHz and 5.0GHz WIFI, supporting 802.11 a/b/g/n//ac/ax, supporting BT 5.2 Bluetooth communication (Bluetooth V5.2 of 1, 2 and 3 Mbps)
B2B connection interface	
Interface	SMT, Stamp Half Hole
PIN	Total 156PIN
Electrical characteristics	
Power supply	DC: DC3.5~7V, TYP:DC 5V,1500mA)(default) USB: DC3.5~7V, TYP:DC 5V,500mA Battery: Single Li Battery(4.2V)
OS	
OS	Optional Android or Linux
Environment	
Working Environment	Temperature: 0°C~60°C natural convection, humidity: 10%~90%RH@31°C non-condensing

Storage Environment	Temperature: -40°C~85°C, humidity:5%~95%RH@39°C non-condensing
Size	
Size	40mm*55mm

### 1.3.2 Base Board Specification:

DJ-A133 base board is designed with High TG HDI and ultra-thin. It integrates LVDS (or RGB or MIPI DSI) LCD interface, Audio, Gigabit Ethernet, Micro SD, MINI PCIe 4G modem interface, USB, UART, GPIO, RTC and other functions. It is connected to the base board through SMT. It fully adapts to the core board functions, with high reliability and strong stability. The motherboard is composed of a core board and a base board, and its design meets the design needs of users in different industries.

We can provide A133/A133P core board with different configurations according to customer needs, and also provide customized services according to customer needs.

We can also customize services for different base boards according to customer needs.

The detailed specification list of the base board is as follows:

B2B connection interface	
Interface	Stamp Hole
PIN	Total 156PIN
Storage	
TF Card Slot	1*TF card slot, supporting 8GB/16GB/32GB/64GB...
Network	
Ethernet	1*Gigabit Ethernet port, RJ45 interface
Modem	1*MINI PCIe card slot, supporting various 4G modules, with SIM card slot
Display	
LVDS	1*Dual channel LVDS interface (2*16PIN header), compatible with various dual eight, dual six, single eight, and single six LVDS interface, up to 1920x1200@60fps. Optional RGB (1280* 720@60fps) or MIPI DSI (1920* 1200@60fps) interface
Backlight	1*LVDS backlight power supply control interface (6PIN socket)
Touch	1*Touch interface(I2C, 6PIN socket), and support for various USB interface touch
Audio	
Headphone	1*Headphone jack (3.5mm, stereo, microphone input)
Speaker	1*Speaker interface (4PIN socket),with power amplifier circuit, support left and right channel output, built-in 8Ω/2W power amplifier
MIC	1*MIC interface(2PIN socket)
USB	
USB 2.0 HOST/OTG	1*USB 2.0 HOST TYPE A 1*USB 2.0 OTG Type A 3*USB 2.0 HOST (Hub expansion, 4PIN socket)
UART	
Debug UART	1*RS232/TTL interface (UART0,4PIN socket, default RS232, It can be modified to a user

	UART by modifying the software)
User UART	1*RS232/TTL interface(UART2,4PIN socket, default RS232) 1*TTL/ RS232 interface(UART1,4PIN socket, time-shared with Bluetooth module, default for BT using, Not assembling socket)
Camera	
USB Camera	support various USB UVC cameras
CMOS Camera	1*MIPI Camera interface(30PIN sockets), supporting 13M MIPI CSI Camera modules (4 Lanes)
Peripheral Interface	
GPIO	1 group of GPIO interfaces(5 GPIOs,7PIN socket )
KEY	1 group of KEY interfaces((RESET, PWRON,LRADC),4PIN socket)
LED	1 group of LEDs (red and blue)
IR	1*IR interface (3PIN socket),supporting infrared remote control
RTC	Support
Sleep / Wake up	Support
System Upgrade	Support local USB, TF upgrade
OS	
OS	Optional Android or Linux
Electrical characteristics	
Power supply	DC 12V
Environment	
Working Environment	Temperature: 0°C~60°C natural convection, humidity: 10%~90%RH@31°C non-condensing
Storage Environment	Temperature: -40°C~85°C, humidity:5%~95%RH@39°C non-condensing
Size	
Size	88mm*118mm

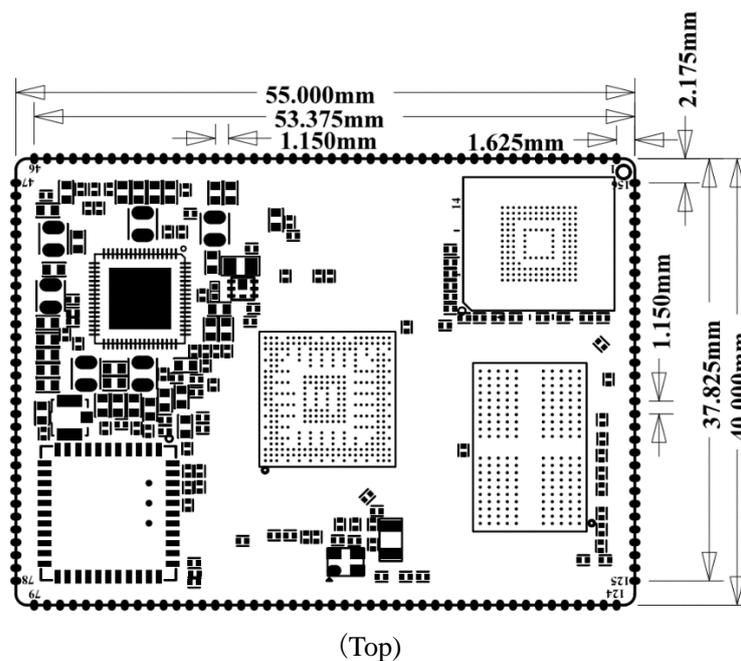
## Chapter 2 Mechanical parameters of the motherboard

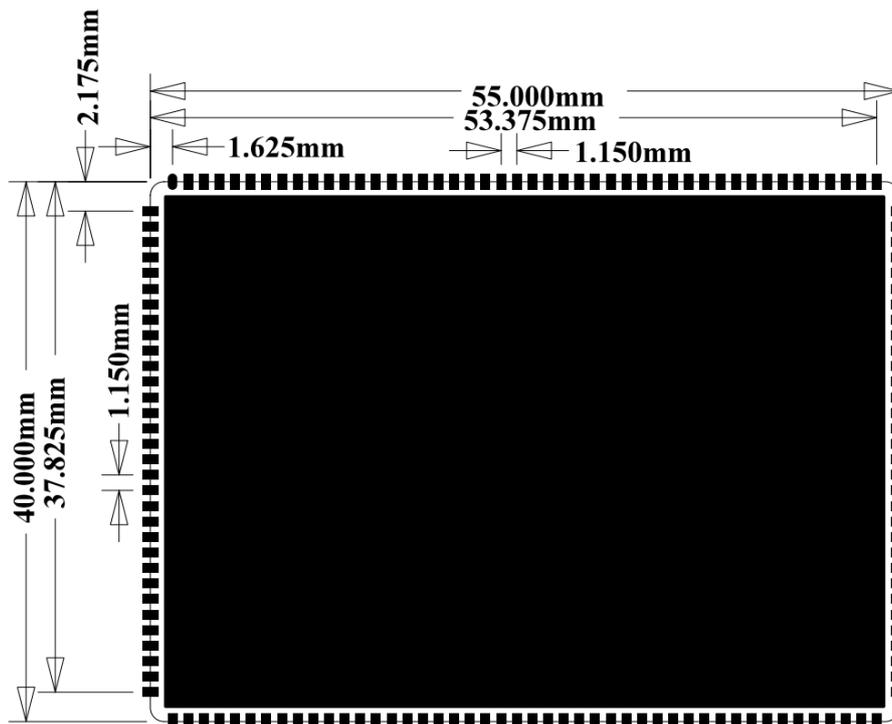
### 2.1 Mechanical dimensions and location diagram of the motherboard

This section introduces the mechanical dimensions and location diagram of the DJ-A133 motherboard.

#### 2.1.1 Mechanical dimensions and location diagram of the core board:

The size of the DJ-A133 core board is 40mm\*55mm. The mechanical dimensions and location diagram are as follows:

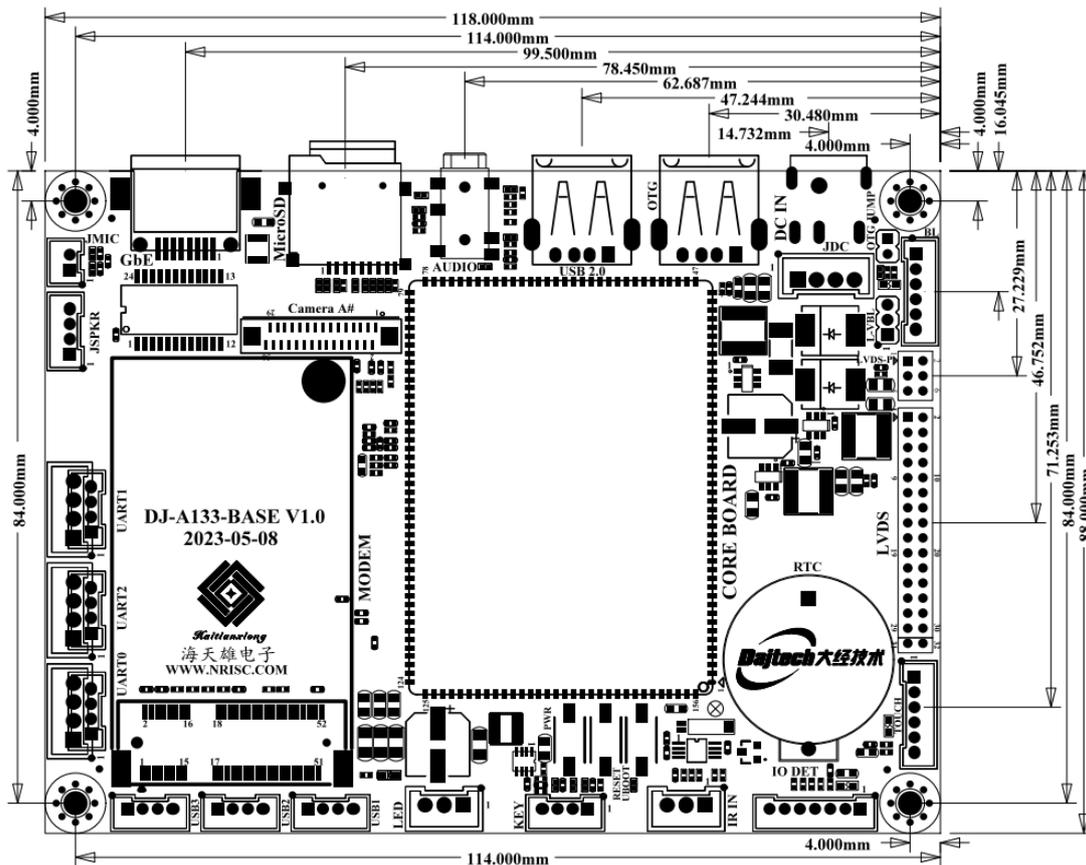


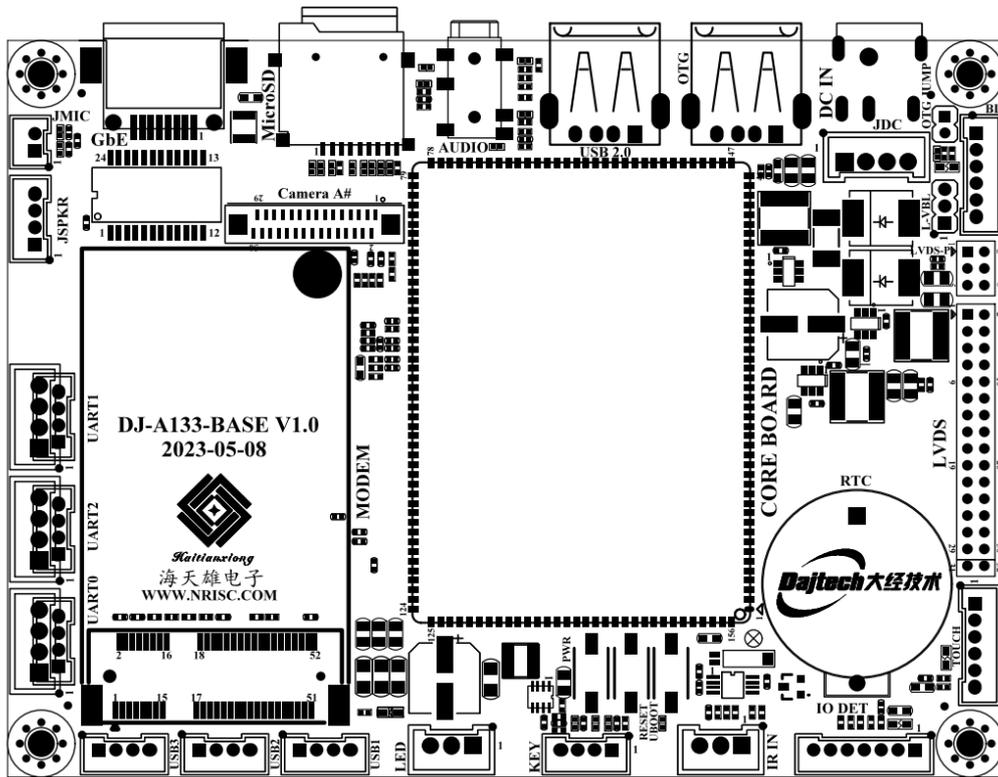


(Bottom)

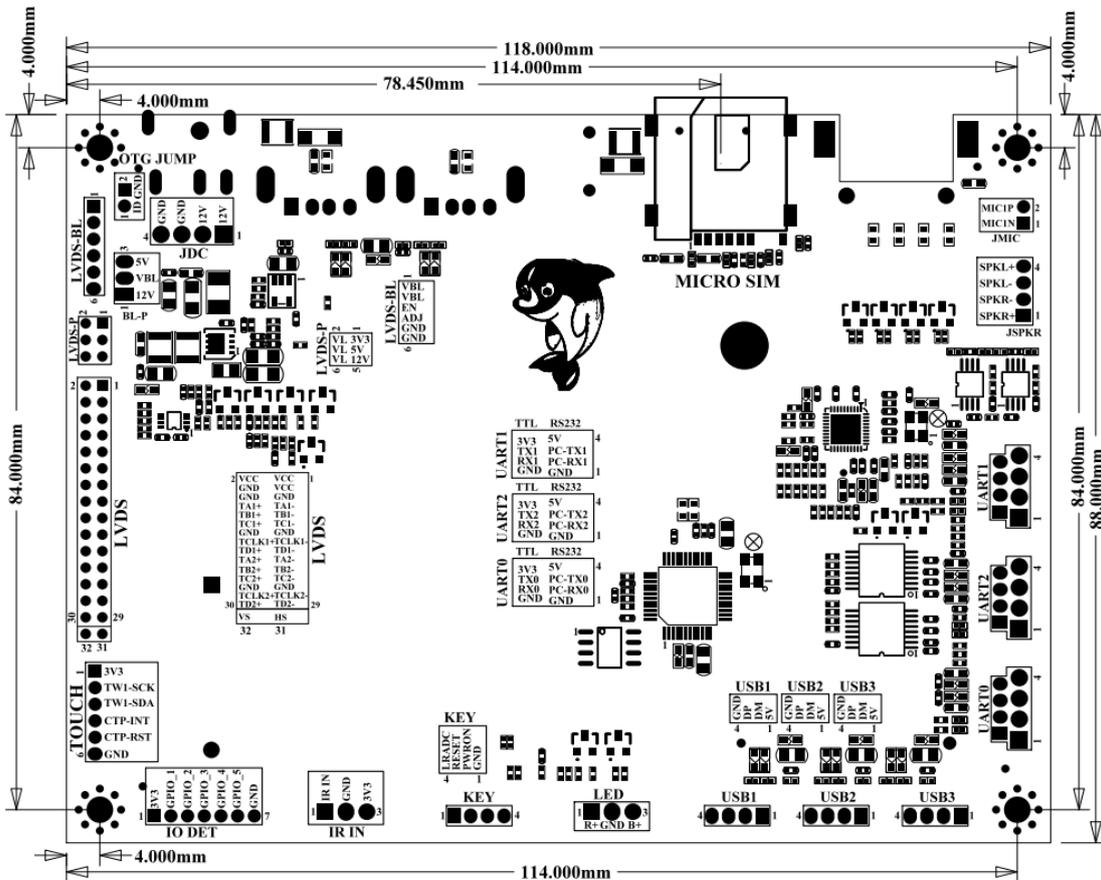
### 2.1.2 Mechanical dimensions and location diagram of the base board:

The size of the DJ-A133 base board is 88mm \* 118mm. The mechanical dimensions and location diagram are as follows:

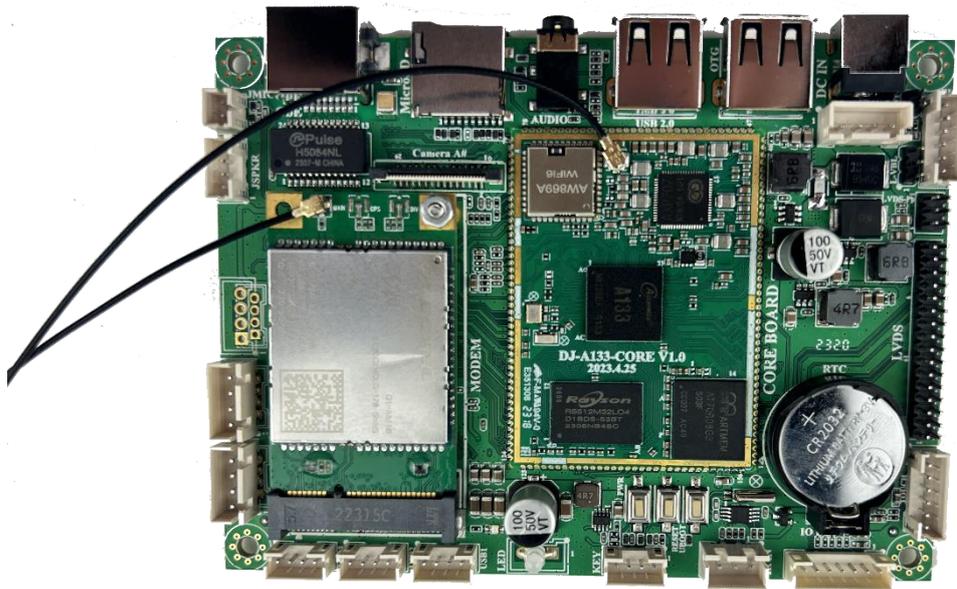
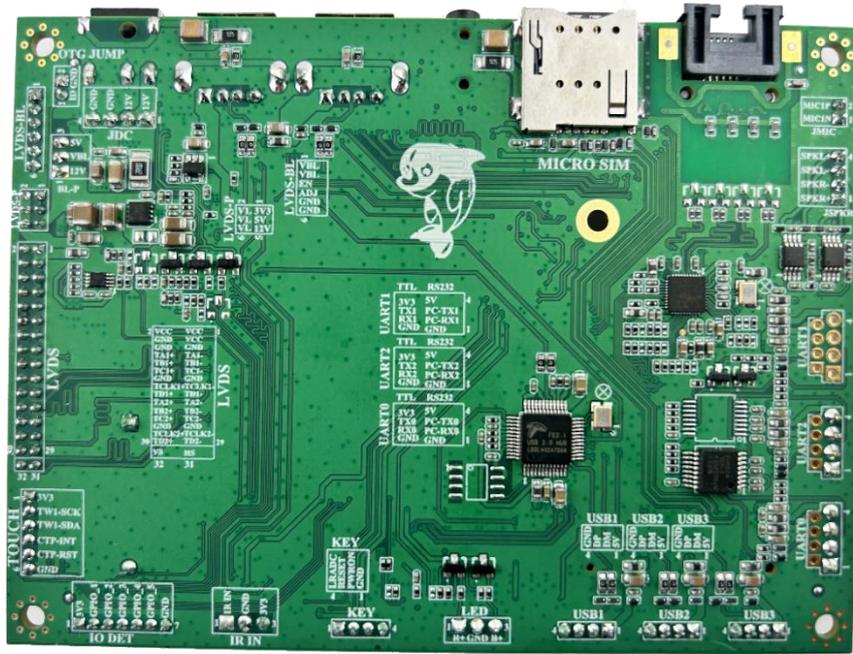




(Top)







# Chapter 3 Installation Instruction

## 3.1 Installation notes

Special care must be taken during the installation of equipment, for some parts, if installed incorrectly, it will not work properly.

**Note: Before operation, please wear an electrostatic bracelet/glove, because static electricity may damage the parts.**

**⚠ The key components of the motherboard are integrated ICs, and these components are easily to be damaged because of the impact of static electricity. Therefore, before installing the motherboard, please do the following preparations:**

- A. Please hold the board edge while holding, try not to touch the pins of components and plug sockets.
- B. It is best to wear anti-static bracelets / gloves when touching the components of integrated circuit (such as CPU, RAM, etc.).
- C. Before installing the integrated circuit ICs, the components need to be placed in the anti-static mat or anti-static bag.
- D. Pay attention to whether the connected peripherals are short-circuited with the motherboard.
- E. During the installation and fixation process, avoid deformation of the motherboard due to fixation reasons.
- F. When installing the LCD screen, please check whether the voltage and current of the screen are correct. Pay attention to the direction of the first pin of the connector.
- G. When installing the LCD screen, if the power of the screen backlight is above 20W. Please use another power board for power supply, do NOT use the power supply of the motherboard.
- H. When installing peripherals (USB, UART, IO...), check if the level and current input/output of the peripherals match those of the motherboard.
- I. When installing UART peripherals, check if the peripherals are directly connected to the 232/TTL of the motherboard, and check if the TX and RX connections are correct.
- J. Check whether the input power is connected to the power input interface, and confirm whether the input power voltage and current meet the requirements according to the overall peripheral evaluation; prevent the power supply from the backlight socket for easy operation.
- K. Check if the motherboard power supply is DC 12V.
- L. After confirming that the power switch is off, then plug in the power plug again.

## 3.2 Installation Procedure

Follow these steps to assemble your computer:

- A. Refer to user's manual to adjust well all Jumpers (jumper cap) on DJ-A133 motherboard.
- B. Check if the core board and base board are assembled correctly.
- C. Install other extended peripherals.
- D. Connect all signal cables, panel control cables and power supplies.
- E. Start the motherboard to complete the program settings.

### **Reminder:**

1. Please make sure to choose the appropriate screws and use the correct installation method, otherwise it may damage the motherboard.
2. How to identify the first pin of the jumper and connector? You should observe the silk screen markings on the back or side of the jumper and connector, the first pin will be represented by triangular symbols or "1" or bold lines. You should also carefully observe the bottom solder pad. The square solder pad is the first pin. When inserting devices and connecting cables, be sure to identify the first pin, otherwise it may damage the motherboard.
3. How to identify connector functions? You can observe the silkscreen markings on the top and bottom of PCB.

### **Reminder:**

The LVDS interface of the motherboard supports the operating voltage of the LCD screen as 3.3V, 5V and 12V, and the default is 3.3V. Before connecting LVDS LCD screen, please confirm its required operating voltage, and then set jumper cap. The backlight interface of the motherboard supports the backlight voltage of the LCD screen as 5V and 12V, and the default is 5V. Before using the screen backlight control, check the backlight voltage and then set the jumper cap.

**Note:** Here the voltage setting must be checked clearly and carefully, otherwise it may burn the LCD screen or motherboard!

# Chapter 4 Hardware parameters of the motherboard

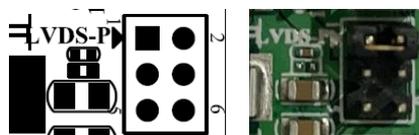
## 4.1 Jumper Function Settings

Before installing the hardware devices, please set the corresponding jumpers according to your needs based on the following table.

**Note: Be sure to jumper according to your needs, otherwise it is easy to burn external devices such as LCD screen, thus leading to the failure of the motherboard. Our company is not responsible for free maintenance of this kind of damage**

**Reminder:** How to identify the first pin of the jumper and connector? You should observe the silk screen markings on the back or side of the jumper and connector, the first pin will be represented by triangular symbols or "1" or bold lines. You should also carefully observe the bottom solder pad. The square solder pad is the first pin.

### 4.1.1 LVDS LCD Power Supply Settings

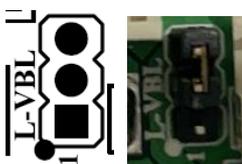


LVDS power jumper definition (LVDS-P):

Settings	LVDS VDD
1-2 Short Circuit	LVDS power supply is 3.3V (default)
3-4 Short Circuit	LVDS power supply is 5V
5-6 Short Circuit	LVDS power supply is 12V

**Note:** Only one jumper cap is allowed for LVDS-P three groups of jumpers. If there are multiple jumper caps at the same time, the circuit will be short-circuited and the motherboard will be damaged! **Our company is not responsible for the free repair of such damages!**

### 4.1.2 LCD Backlight Power Supply Settings

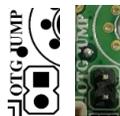


LCD backlight power jumper definition (L-VBL (BL-P)):

Settings	L-VBL (BL-P)

1-2 Short Circuit	LCD backlight power supply is 12V
2-3 Short Circuit	LCD backlight power supply is 5V(default)

### 4.1.3 USB OTG Settings



OTG JUMP for USB ID settings, which are defined as follows:

Settings	OTG JUMP
1-2 Short Circuit	OTG is USB HOST, which can access a variety of peripherals
1-2 Open Circuit	OTG is USB DEVICE, for downloading program purpose (default)

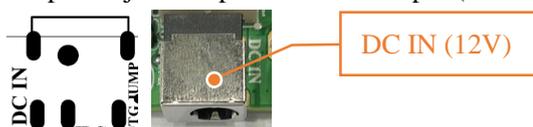
## 4.2 Motherboard Interface Description

⚠ Please read this manual carefully before connecting the external connectors and cables to avoid damaging the motherboard!

### 4.2.1 Power Interface (DC IN 和 12V IN)

The motherboard is powered by a DC12V power supply, which only allows power to the board from DC jack or JDC connector. The power supply voltage is 12V, and the recommended power supply current is 5A.

1. The motherboard provides 1 standard power jack for power DC12V input (DC IN)



2. The motherboard provides 1 connector for power DC12V input(12V IN:JDC, 4PIN, 2.54mm pitch socket)



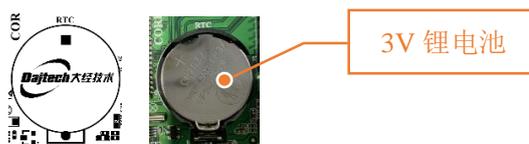
JDC is a 2.54mm pitch, 4PIN socket. The definition of pins is as follows:

Pin	Signal Name	Attribute	Description
1	12V	Power	DC12V input
2	12V	Power	DC12V input
3	GND	Ground	Ground
4	GND	Ground	Ground

### 4.2.2 RTC Battery Interface (RTC)

Standard CR2032 interface, which is used to power up the system clock when the motherboard is

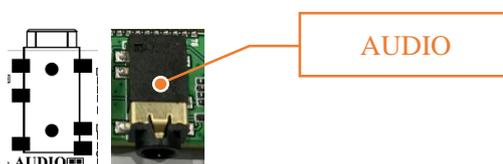
powered off.



Pin	Signal Name	Attribute	Description
1	VDD_RTC	Power	3V Lithium battery input
2	GND	Ground	Ground

### 4.2.3 Headphone Interface (AUDIO)

Headphone interface is a standard 3.5mm headphone interface, as follows:

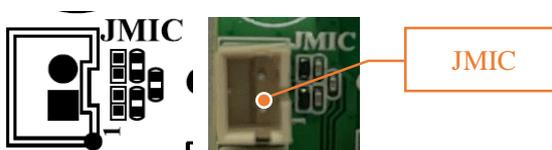


AUDIO pin definition:

Pin	Signal Name	Attribute	Description
1	MIC_INP	Analog input	Voice input
2	GND	Ground	Ground
3	HPOUTR	Analog output	Right channel
4	HPOUTL	Analog output	Left channel
5	HP_DET	Digital input	Headset recognition

### 4.2.4 Audio Input Interface (JMIC)

Audio input interface (JMIC) can be an external microphone for recording calls, the interface is as shown:

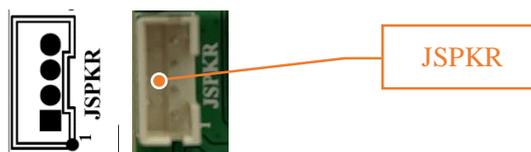


JMIC is a 2.0mm pitch, 2PIN socket. The definition of pins is as follows:

Pin	Signal Name	Attribute	Description
1	MIC1N	Analog Input	Audio input-
2	MIC1P	Analog Input	Audio output+

### 4.2.5 Audio Output (Speaker) Interface (JSPKR)

The speaker interface (JSPKR) can connect two external speakers (8  $\Omega$ /2W), the interface is as shown:

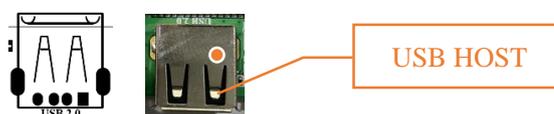


JSPKR is a 2.0mm pitch, 4PIN socket. The definition of pins is as follows:

Pin	Signal Name	Attribute	Description
1	SPKR+	Output	speaker output right+
2	SPKR-	Output	speaker output right-
3	SPKL-	Output	speaker output left-
4	SPKL+	Output	speaker output left+

## 4.2.6 USB HOST 2.0 Interface (USB 2.0)

USB 2.0 is USB HOST 2.0, TYPE A standard interface, the interface is as shown:



USB 2.0 pin definition:

Pin	Signal Name	Attribute	Description
1	VDD_5V	Power	DC5V output
2	HUB_DM1	Differential	USB HUB1 D-
3	HUB_DP1	Differential	USB HUB1 D+
4	GND	Ground	Ground

## 4.2.7 USB OTG 2.0 Interface (OTG)

OTG is TYPE A standard interface, which can be used as USB HOST or USB DEVICE by jumper OTG JUMP, the interface is as shown:



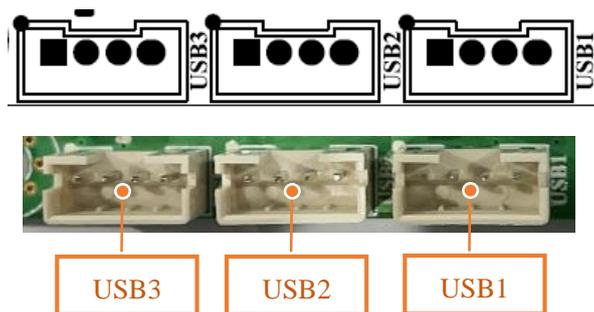
OTG pin definition:

Pin	Signal Name	Attribute	Description
1	USBVBUS	Power	DC5V input(DEVICE)/output(HOST)
2	OTG_DM	Differential	USB OTG D-
3	OTG_DP	Differential	USB OTG D+
4	GND	Ground	Ground

## 4.2.8 USB HOST 2.0 Interface (USB1、USB2、USB3)

USB1 of A133 chip expands three groups of USB HOST 2.0 interface (USB1, USB2 and USB3) through USB HUB chip, which can be used by external USB devices, including keyboard, mouse,

storage device, etc. the interface is as shown:

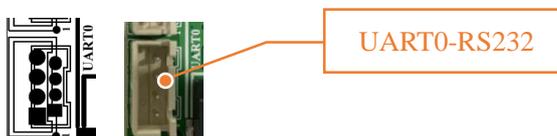


USB1, USB2 and USB3 interfaces are 2.0mm pitch and 4PIN sockets. The pin definitions are same as follows:

Pin	Signal Name	Attribute	Description
1	5V	Power	DC5V output
2	DM	Differential	USB D-
3	DP	Differential	USB D+
4	GND	Ground	Ground

### 4.2.9 UART0 Interface (UART0-TTL and UART0-RS232)

UART0 can be used as RS232 serial port or 3.3V TTL (CPU UART0) serial port, which is used for program debugging. The default is RS232 serial port, as shown:



UART0-TTL interface is a 2.0mm pitch, 4PIN socket, default is not assembled. UART0-RS232 interface is a 2.54mm pitch, 4PIN socket, default is assembly.

The pin definition of UART0-RS232 is as follows (default assembly):

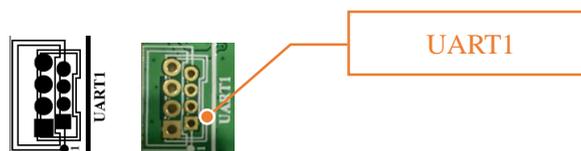
Pin	Signal Name	Attribute	Description
1	GND	Ground	Ground
2	PC-RX0	Input	RS232 data input (UART0)
3	PC-TX0	Output	RS232 data output (UART0)
4	5V	Power	DC5V output

The pin definition of UART0-TTL is as follows (default not assembled):

Pin	Signal Name	Attribute	Description
1	GND	Ground	Ground
2	RX0	Input	TTL data input (UART0)
3	TX0	Output	TTL data output (UART0)
4	3V3	Power	DC3.3V output

## 4.2.10 UART1 Interface (UART1-TTL and UART1-RS232)

UART1 can be used as RS232 serial port or 3.3V TTL (CPU UART1) serial port, which is shared with the Bluetooth module. If the user does not need the Bluetooth module function, we can release UART1 for the user to use by modifying the software. Default is not assembled, as shown:



UART1-TTL interface is a 2.0mm pitch, 4PIN socket, default is not assembled. UART1-RS232 interface is a 2.54mm pitch, 4PIN socket, default is not assembled.

The pin definition of UART1-TTL is as follows (default not assembled):

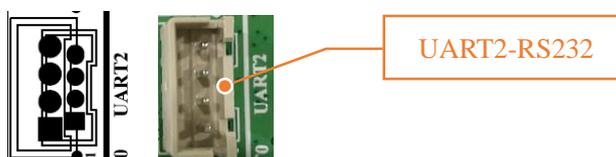
Pin	Signal Name	Attribute	Description
1	GND	Ground	Ground
2	RX1	Input	TTL data input (UART1)
3	TX1	Output	TTL data output (UART1)
4	3V3	Power	DC3.3V output

The pin definition of UART1-RS232 is as follows (default not assembled):

Pin	Signal Name	Attribute	Description
1	GND	Ground	Ground
2	PC-RX1	Input	RS232 data input (UART1)
3	PC-TX1	Output	RS232 data output (UART1)
4	5V	Power	DC5V output

## 4.2.11 UART2 Interface (UART2-TTL and UART2-RS232)

UART2 can be used as RS232 serial port or 3.3V TTL (CPU UART1) serial port, which can be used by users themselves. The default is RS232 serial port, as shown:



UART2-TTL interface is a 2.0mm pitch, 4PIN socket, default is not assembled. UART1-RS232 interface is a 2.54mm pitch, 4PIN socket, default is assembly.

The pin definition of UART2-RS232 is as follows (default assembly):

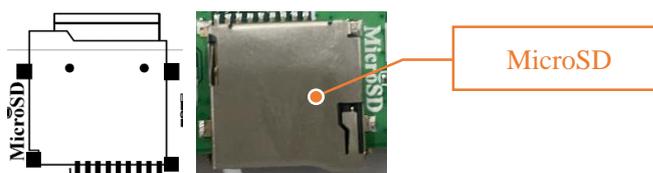
Pin	Signal Name	Attribute	Description
1	GND	Ground	Ground
2	PC-RX2	Input	RS232 data input (UART2)
3	PC-TX2	Output	RS232 data output (UART2)
4	5V	Power	DC5V output

The pin definition of UART2-TTL is as follows (default not assembled):

Pin	Signal Name	Attribute	Description
1	GND	Ground	Ground
2	RX2	Input	TTL data input (UART2)
3	TX2	Output	TTL data output (UART2)
4	3V3	Power	DC3.3V output

#### 4.2.12 Micro SD Card Slot Interface (MicroSD)

Micro SD card slot interface (MicroSD) can be accessed by a variety of Micro SD (TF) cards, as shown:

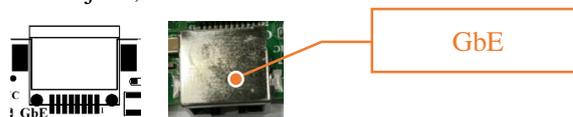


MicroSD pin definition:

Pin	Signal Name	Attribute	Description
1	DATA2	Output/Input	Data signal DATA2
2	CD/DATA3	Output/Input	Data signal DATA3
3	CMD	Output	Control signal CMD
4	VDD	Power	DC3.3V
5	CLK	Output	Clock signal
6	VSS	Ground	Ground
7	DATA0	Output/Input	Data signal DATA0
8	DATA1	Output/Input	Data signal DATA1
9	CD	Input	Detection signal

#### 4.2.13 Gigabit Ethernet Interface (GbE)

Gigabit ethernet interface is ultra-thin RJ45 jack, as shown:



GbE pin definition:

Pin	Signal Name	Attribute	Description
1	DA+	Differential	TX_D1+ Transmit Data+
2	DA-	Differential	TX_D1- Transmit Data-
3	DB+	Differential	RX_D2+ Receive Data+
4	DC+	Differential	BI_D3+ Bi-directional Data+
5	DC-	Differential	BI_D3- Bi-directional Data-
6	DB-	Differential	RX_D2- Receive Data-
7	DD+	Differential	BI_D4+ Bi-directional Data+
8	DD-	Differential	BI_D4- Bi-directional Data-

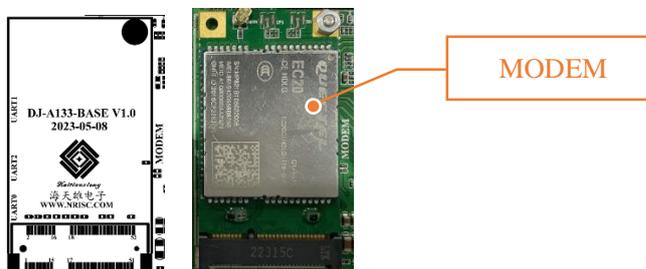
#### 4.2.14 WIFI/BT Combo Module

The motherboard has a built-in WIFI/BT module, compatible with a variety of modules, the default is WIFI6/BT5.2 combination module AW869A, supports WIFI6, supports 2.4GHz and 5.0GHz WIFI, supports 802.11 a/b/g/n/ac/ax standard, support BT 5.2 Bluetooth communication (Bluetooth V5.2 of 1, 2 and 3 Mbps). The module can be selected according to customer needs. The IPEX antenna socket is assembled on the board, and users can choose different antenna according to their specific usage environment. The module and antenna socket are as shown:



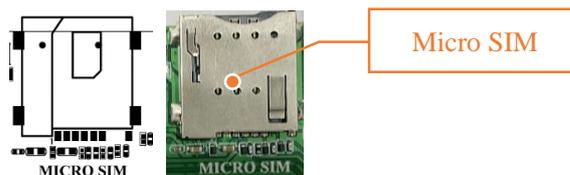
#### 4.2.15 MINI PCIe 4G Interface (MODEM)

MINI PCIe 4G interface (MODEM) can be accessed by a variety of MINI PCIe 4G modules, the interface is as shown:



#### 4.2.16 Micro SIM Card Slot Interface (Micro SIM)

The micro SIM card slot is located on the bottom of the board. The centerline of the card slot is consistent with the centerline of the MicroSD card slot. It supports different Micro SIM cards and works with MINI PCIE 4G module. The interface is as shown:



## 4.2.17 Camera Module Interface (Camera A#)

The camera module interface (Camera A#) is MIPI CSI interface, the default is 13M pixels, the user can realize the function by connecting the corresponding camera module. The interface is as shown:



Camera A# interface is a 0.5mmpitch, 30PIN FFC vertical socket. The definition of pins is as follows:

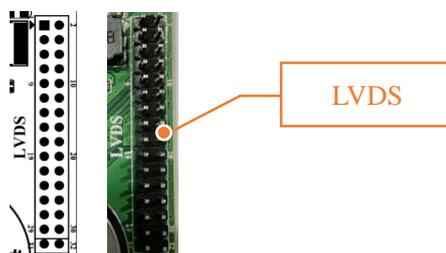
Pin	Signal Name	Attribute	Description
1	NC	NC	Reserve
2	AFVCC-CSI	Power	DC2.8V output
3	DVDD-CSI	Power	DC1.2V output
4	IOVDD-CSI	Power	DC1.8V output
5	NC	NC	Reserve
6	GND	Ground	Ground
7	AVDD-CSI	Power	DC2.8V output
8	GND	Ground	Ground
9	MCSI-SDA(TWI2_SDA)	Input/Output	I2C SDA
10	MCSI-SCK(TWI2_SCK)	Output	I2C SCL
11	MCSI-RST-R(PE9)	Output	Reset
12	MCSI-STBY-R(PE8)	Output	Power-down
13	GND	Ground	Ground
14	MCSI-MCLK0	Output	Master clock
15	GND	Ground	Ground
16	MCSIA-D3P	Differential	MIPI CSI A Data Channel 3+
17	MCSIA-D3N	Differential	MIPI CSI A Data Channel 3-
18	GND	Ground	Ground
19	MCSIA-D2P	Differential	MIPI CSI A Data Channel 2+
20	MCSIA-D2N	Differential	MIPI CSI A Data Channel 2-
21	GND	Ground	Ground
22	MCSIA-D1P	Differential	MIPI CSI A Data Channel 1+
23	MCSIA-D1N	Differential	MIPI CSI A Data Channel 1-
24	GND	Ground	Ground
25	MCSIA-CLKP	Differential	MIPI CSI A Clock Channel+
26	MCSIA-CLKN	Differential	MIPI CSI A Clock Channel-
27	GND	Ground	Ground
28	MCSIA-D0P	Differential	MIPI CSI A Data Channel 0+
29	MCSIA-D0N	Differential	MIPI CSI A Data Channel 0-
30	GND	Ground	Ground

## 4.2.18 LVDS LCD Interface (LVDS)

### Tips:

The LVDS interface of the motherboard supports the operating voltage of the LCD screen as 3.3V, 5V and 12V, and the default is 3.3V. Before connecting LVDS LCD screen, please confirm its required operating voltage, and then set jumper cap. Otherwise, it may cause irreversible damage to the LCD screen. Please refer to 4.1.1 LVDS LCD power supply settings for voltage settings.

LVDS interface supports dual-channel 24bit (dual-eight) LCD display (with the highest resolution 1920x1200@60fps), compatible with single-channel LVDS interface (with the highest resolution 1366x768@60fps). The interface is as shown:



LVDS Interface is a 2.0mm, 2\*16PIN header, and the first 30 pins correspond to standard double 8 interface. LVDS interface can also be used as RGB or MIPI DSI LCD screen interface. The definition of pins is as follows:

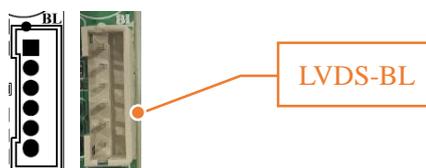
Pin	Signal Name	Attribute	Description
1	VCC	Power	LCD power output, Optional 3.3V/5V/ 12V
2	VCC	Power	LCD power output, Optional 3.3V/5V/ 12V
3	VCC	Power	LCD power output, Optional 3.3V/5V/ 12V
4	GND	Ground	Ground
5	GND	Ground	Ground
6	GND	Ground	Ground
7	TA1- (LVDS0_D0N)	Differential	LVDS_ODD_D0 DATA-
8	TA1+ (LVDS0_D0P)	Differential	LVDS_ODD_D0 DATA+
9	TB1- (LVDS0_D1N)	Differential	LVDS_ODD_D1 DATA-
10	TB1+ (LVDS0_D1P)	Differential	LVDS_ODD_D1 DATA+
11	TC1- (LVDS0_D2N)	Differential	LVDS_ODD_D2 DATA-
12	TC1+ (LVDS0_D2P)	Differential	LVDS_ODD_D2 DATA+
13	GND	Ground	Ground
14	GND	Ground	Ground
15	TCLK1- (LVDS0_CKN)	Differential	LVDS_ODD_CLK DATA-
16	TCLK1+ (LVDS0_CKP)	Differential	LVDS_ODD_CLK DATA+
17	TD1- (LVDS0_D3N)	Differential	LVDS_ODD_D3 DATA-
18	TD1+ (LVDS0_D3P)	Differential	LVDS_ODD_D3 DATA+
19	TA2- (LVDS1_D0N)	Differential	LVDS_EVEN_D0 DATA-
20	TA2+ (LVDS1_D0P)	Differential	LVDS_EVEN_D0 DATA+
21	TB2- (LVDS1_D1N)	Differential	LVDS_EVEN_D1 DATA-

22	TB2+ (LVDS1_D1P)	Differential	LVDS_EVEN_D1 DATA+
23	TC2- (LVDS1_D2N)	Differential	LVDS_EVEN_D2 DATA-
24	TC2+ (LVDS1_D2P)	Differential	LVDS_EVEN_D2 DATA+
25	GND	Ground	Ground
26	GND	Ground	Ground
27	TCLK2- (LVDS1_CKN)	Differential	LVDS_EVEN_CLK DATA-
28	TCLK2+ (LVDS1_CKP)	Differential	LVDS_EVEN_CLK DATA+
29	TD2- (LVDS1_D3N)	Differential	LVDS_EVEN_D3 DATA-
30	TD2+ (LVDS1_D3P)	Differential	LVDS_EVEN_D3 DATA+
31	NC		Reserve
32	NC		Reserve

#### 4.2.19 LVDS LCD Backlight Interface (LVDS-BL)

##### Tips:

The backlight interface of the motherboard supports the backlight voltage of the LCD screen as 5V and 12V, and the default is 5V. Before using the screen backlight control, check the backlight voltage and then set the jumper cap. Please refer to 4.1.2 LCD backlight power supply settings for voltage settings. Otherwise, it may cause damage to the LCD backlight or LCD backlight driver board. The interface is as shown:

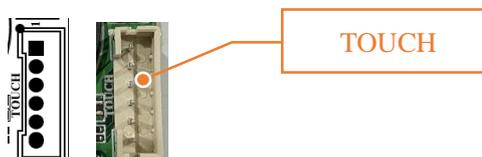


LVDS BL interface a 2.0mm pitch, 6PIN socket. The definition of pins is as follows:

Pin	Signal Name	Attribute	Description
1	VBL	Power	Backlight power output, Optional 5V/ 12V
2	VBL	Power	Backlight power output, Optional 5V/ 12V
3	EN (PB6)	Output	Backlight enabled
4	ADJ (PWM0)	Output	Backlight brightness control
5	GND	Ground	Ground
6	GND	Ground	Ground

#### 4.2.20 LCD Touch Interface (TOUCH)

The LCD TOUCH interface (TOUCH) is an I2C interface, supports various I2C interface capacitive touch screens, and can also be used for external I2C devices. The interface is as shown:



TOUCH interface a 2.0mm pitch, 6PIN socket. The definition of pins is as follows:

Pin	Signal Name	Attribute	Description
1	3V3	Power	DC3.3V output
2	TWI1-SCK	Input/Output	I2C SCL
3	TWI1-SDA	Input/Output	I2C SDA
4	CTP-INT (PH_EINT13)	Input	Interrupt
5	CTP-RST (PD22)	Output	Reset
6	GND	Ground	Ground

#### 4.2.21 GPIO Programmable I/O (IO DET)

GPIO programmable I/O (IO DET) includes 5 user-usable GPIO (3.3V), which can be used as input or output. The interface is as shown:

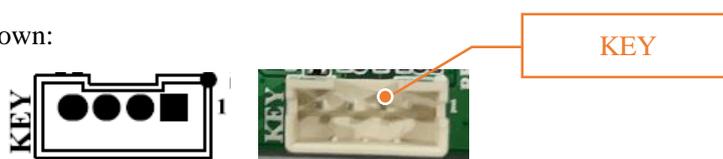


IO DET interface a 2.0mm pitch, 7PIN socket. The definition of pins is as follows:

Pin	Signal Name	Attribute	Description
1	3V3	Power	DC3.3V output
2	GPIO_1 (PC12)	Input/Output	GPIO1
3	GPIO_2 (PC4)	Input/Output	GPIO2
4	GPIO_3 (PC2)	Input/Output	GPIO3
5	GPIO_4 (PC3)	Input/Output	GPIO4
6	GPIO_5 (PC7)	Input/Output	GPIO5
7	GND	Ground	Ground

#### 4.2.22 Key Interface (KEY)

Key interface (KEY) is as shown:

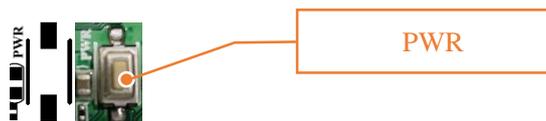


KEY interface a 2.0mm pitch, 4PIN socket. The definition of pins is as follows:

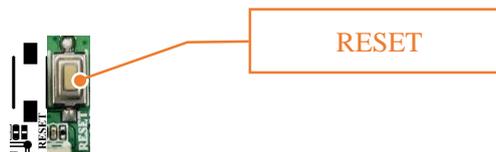
Pin	Signal Name	Attribute	Description
1	LRADC	Input	ADC
2	RESET	Input	Reset
3	PWRON	Input	Power on/off
4	GND	Ground	Ground

#### 4.2.23 Onboard Buttons (PWR, RESET, UBOOT)

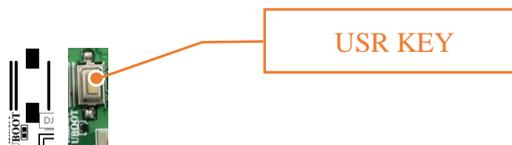
Pressing the PWR button for a long time will turn the core board power on or off, the power button (PWR) is as shown:



Press and release the RESET button, and the motherboard will be reset, the reset button (RESET) is as shown:



Press and hold the UBOOT button when powering on, the motherboard will enter the program download mode, the UBOOT button (UBOOT) is as shown:



#### 4.2.24 Dual Color Indication LED (LED)

LED dual color indication interface (LED) can be external LED, also can be on-board LED, the default is on-board, as shown:



LED interface a 2.54mm pitch, 3PIN socket. The definition of pins is as follows(Default is onboard LED):

Pin	Signal Name	Attribute	Description
1	R+	Red+	Power on indicator
2	GND	Ground	Ground
3	B+	Blue+	System operation indicator

#### 4.2.25 Infrared Remote Control Receiving Interface (IR IN)

The infrared remote control receiving interface (IR IN) is a 2.54mm, 3PIN socket. Users can connect a variety of remote receiver through this interface. The interface is as shown:



IR pin definition:

Pin	Signal Name	Attribute	Description
1	IR IN	Input	Remote control signal input
2	GND	Ground	Ground

3	3V3	Power	DC3.3V output
---	-----	-------	---------------

#### 4.2.26 MIPI DSI LCD Interface (MIPI DSI)

The motherboard supports one 4-lane MIPI DSI LCD interface (resolution up to 1920x1200@60fps), shared with 4.2.18 LVDS LCD interface. If the user chooses a MIPI DSI interface LCD screen, they need to communicate with our company's engineers in advance. The LVDS LCD interface will be redefined as the MIPI DSI LCD interface, with its pins defined as follows:

Pin	Signal Name	Attribute	Description
1	VCC	Power	LCD power output, Optional 3.3V/5V/ 12V
2	VCC	Power	LCD power output, Optional 3.3V/5V/ 12V
3	VCC	Power	LCD power output, Optional 3.3V/5V/ 12V
4	GND	Ground	Ground
5	GND	Ground	Ground
6	GND	Ground	Ground
7	DSI_DM0	Differential	MIPI DSI Data Channel 0-
8	DSI_DP0	Differential	MIPI DSI Data Channel 0+
9	DSI_DM1	Differential	MIPI DSI Data Channel 1-
10	DSI_DP1	Differential	MIPI DSI Data Channel 1+
11	DSI_CKM	Differential	MIPI DSI Clock Channel-
12	DSI_CKP	Differential	MIPI DSI Clock Channel+
13	GND	Ground	Ground
14	GND	Ground	Ground
15	DSI_DM2	Differential	MIPI DSI Data Channel 2-
16	DSI_DP2	Differential	MIPI DSI Data Channel 2+
17	DSI_DM3	Differential	MIPI DSI Data Channel 3-
18	DSI_DP3	Differential	MIPI DSI Data Channel 3+
19	NC		Reserve
20	NC		Reserve
21	NC		Reserve
22	NC		Reserve
23	NC		Reserve
24	NC		Reserve
25	GND	Ground	Ground
26	GND	Ground	Ground
27	NC		Reserve
28	NC		Reserve
29	NC		Reserve
30	NC		Reserve
31	NC		Reserve
32	NC		Reserve

### 4.2.27 RGB LCD Interface (RGB)

The motherboard supports one RGB LCD interface (resolution up to 1280x720@60fps), shared with 4.2.18 LVDS LCD interface. If the user chooses a RGB interface LCD screen, they need to communicate with our company's engineers in advance. The LVDS LCD interface will be redefined as the RGB LCD interface, with its pins defined as follows:

Pin	Signal Name	Attribute	Description
1	VCC	Power	LCD power output, Optional 3.3V/5V/ 12V
2	VCC	Power	LCD power output, Optional 3.3V/5V/ 12V
3	VCC	Power	LCD power output, Optional 3.3V/5V/ 12V
4	GND	Ground	Ground
5	GND	Ground	Ground
6	GND	Ground	Ground
7	LCD0_D3	Output	B3
8	LCD0_D2	Output	B2
9	LCD0_D5	Output	B5
10	LCD0_D4	Output	B4
11	LCD0_D7	Output	B7
12	LCD0_D6	Output	B6
13	GND	Ground	Ground
14	GND	Ground	Ground
15	LCD0_D11	Output	G3
16	LCD0_D10	Output	G2
17	LCD0_D13	Output	G5
18	LCD0_D12	Output	G4
19	LCD0_D15	Output	G7
20	LCD0_D14	Output	G6
21	LCD0_D19	Output	R3
22	LCD0_D18	Output	R2
23	LCD0_D21	Output	R5
24	LCD0_D20	Output	R4
25	GND	Ground	Ground
26	GND	Ground	Ground
27	LCD0_D23	Output	R7
28	LCD0_D22	Output	R6
29	LCD0_DE	Output	DE
30	LCD0_CLK	Output	CLK
31	LCD0_HSYNC	Output	HSYNC
32	LCD0_VSYNC	Output	VSYNC

## Chapter 5 Electrical Characteristics

### 5.1 Operation and Storage Environment

Grade	Item	Min	Typ	Max	
Commercial	Temperature	operation	0°C	--	60°C
		storage	-40°C		85°C
Commercial	Humidity (Non-condensing)	operation	10%RH	--	90%RH
		storage	5%RH	--	95%RH

### 5.2 Electrical parameters

Item		Min	Typ	Max	
Power Supply	Voltage	9V	12V	15V	
	Ripple	--	--	50mV	
	Current	3A	--	--	
Current (LVDS)	Operating Current (3.3V)	--	400 mA	500 mA	
	Operating Current (5V)	--	550 mA	1A	
	Operating Current (12V)	--	580 mA	1A	
	Operating Current (USB)	--	--	500mA	
GPIO characteristics	Output (OUT)	VH	3.15V	--	--
		VL	--	--	0.15V
	Input (IN)	VH	2.3V	--	3.3V
		VL	0V		0.8V
RTC	2032 Cell Voltage	2.4V	3.0V	3.6V	
	Current	--	--	40μA	

## Appendix

### Appendix I: Acronyms and Abbreviations

#### UART

UART (Universal Asynchronous Receiver/Transmitter) is a computer hardware device for asynchronous serial communication in which the data format and transmission speeds are configurable. It sends data bits one by one, from the least significant to the most significant, framed by start and stop bits so that precise timing is handled by the communication channel. The electric signaling levels are handled by a driver circuit external to the UART. Common signal levels are RS-232, RS-485, and TTL.

#### LVDS

LVDS (Low-voltage differential signaling), also known as TIA/EIA-644, is a technical standard that specifies electrical characteristics of a differential, serial signaling standard. LVDS operates at low power and can run at very high speeds using inexpensive twisted-pair copper cables.

#### HDMI

HDMI (High-Definition Multimedia Interface) is a proprietary audio/video interface for transmitting uncompressed video data and compressed or uncompressed digital audio data from an HDMI-compliant source device, such as a display controller, to a compatible computer monitor, video projector, digital television, or digital audio device. HDMI is a digital replacement for analog video standards.

#### eMMC

eMMC (Embedded Multi Media Card) is a small storage device made up of NAND flash memory and a simple storage controller. The eMMC standard for embedded flash memory applications was developed in 2006 by JEDEC and the MultiMediaCard Association.

#### DRAM

DRAM (Dynamic random-access memory) is a type of random-access semiconductor memory that stores each bit of data in a memory cell, usually consisting of a tiny capacitor and a transistor, both typically based on metal–oxide–semiconductor (MOS) technology. Such as SDRAM、DDR SDRAM and LPDDR.

#### LAN

LAN (Local area network) is a computer network that interconnects computers within a limited area such as a residence, school, laboratory, university campus or office building. Ethernet and Wi-Fi are the two most common technologies in use for LANs.

## **USB**

USB (Universal Serial Bus) is an industry standard that specifies the physical interfaces and protocols for connecting, data transferring and powering of hosts, such as personal computers, peripherals, e.g. keyboards and mobile devices, and intermediate hubs. USB was designed to standardize the connection of peripherals to computers.

## **LED**

LED (Light-emitting diode) is a semiconductor device that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

## Appendix II: Common Fault Analysis and Resolution

Common Fault	Check Point
Unable to start after power on	<ol style="list-style-type: none"> <li>1. Please check if the power cable is connected properly or not</li> <li>2. Please confirm whether the power supply used meets the requirements of the motherboard</li> <li>3. Please confirm whether there is an external card, and remove the external card to check if everything is in normal</li> </ol>
The screen does not display after startup	<ol style="list-style-type: none"> <li>1. Please check if the LCD screen and motherboard are connected properly or not</li> <li>2. Please check if the LCD screen power and backlight power are set correctly or not</li> </ol>
Unable to enter the system after booting	<ol style="list-style-type: none"> <li>1. Please confirm the correction of the program version</li> <li>2. Please confirm the correction of program burning</li> </ol>
System time cannot be saved	<ol style="list-style-type: none"> <li>1. Please confirm whether a 3V 2032 lithium battery is placed in the RTC battery socket of the motherboard</li> <li>2. Please confirm whether the voltage of the RTC lithium battery on the motherboard is lower than 2.8V, if it is lower than 2.8V, please replace the battery, reset and save</li> </ol>
Unable to detect USB device	<ol style="list-style-type: none"> <li>1. Please confirm whether the USB device needs a separate power supply</li> <li>2. Please confirm whether the USB interface is poor contact</li> </ol>
Peripherals do not work	<ol style="list-style-type: none"> <li>1. Please confirm whether the system supports such peripherals</li> <li>2. Please confirm whether the load capacity of the motherboard meets the requirements of the peripherals</li> <li>3. Please confirm whether the connection between the peripherals and the motherboard is correct</li> </ol>