

华北工控
NORCO

EMB-3501

USER' Manual V1.0

用户手册

USER'Manual



Industrial & Communication Computer 

做中国最可信赖的工控产品

EMB-3501

USER' Manual V1.0

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Safety Instructions

- 1 . Please read the product manual carefully before using this product.
- 2 . Put all the unused or uninstalled boards or electronic components in a static dissipative surface or static shielding bag.
- 3 . Always ground yourself to remove any static discharge before touching the board, to place your hands on grounding metal object for a while or wear a anti-static wrist strap at all times.
- 4 . When taking or fetching the boards or cards, please wear antistatic gloves and have the habit of holding the boards by its edges.
- 5 . Make sure that your power supply is set to the correct voltage in your area. Incorrect voltage may cause personal injuries and damage the system.
- 6 . To prevent electronic shock hazard or any damage to the product, please ensure that all power cables for the devices are unplugged when adding or removing any devices or reconfiguring the system.
- 7 . To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- 8 . When adding or removing devices to or from the system, ensure that all the power cables for the devices are unplugged in advance.
- 9 . To prevent any unnecessary damage to the products due to frequent power on/off, please wait at least 30 seconds to restart the unit after the shutdown.
- 10 . If system goes wrong during the operation, do not try to fix it by yourself. Contact a qualified service technician or your retailer.
- 11 . This product is classified as Class A product, which may cause radio interference in our living environment. On this occasion, users need to take measures to handle the interference.

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Packing List

Thanks for purchasing NORCO products. Please check the accessories as per the packing list when you open the package. If you find any components/parts defected, damaged or lost, please contact your vendor ASAP.

- EMB-3501 V1.0 motherboard 1 pcs



Chapter One
Product Introduction

Chapter One Product Introduction

1.1 Hardware Specification

Size

- Size:146mmX102mm

Processor

- CPU: IMX6Q/DL/S

System Memory

- Onboard Memory: default 1GB, supports DDR III 800

Display

- Display Port: VGA, LVDS, HDMI
- VGA: 1x VGA port
- LVDS: 1x dual channel LVDS 2.0mm pin, supports 24Bit 1920x1080@60Hz
- HDMI: i.MX6 series integrated CPU, supports maximum resolution: 1920x1080@60Hz

Ethernet

- network controller: RJ45(10/100/1000Mbps) X 1

Storage

- Supports 2x standard 7Pin SATA port
- SD: supports Micro SD
- FLASH: onboard 8GB INAND

AUDIO

- Applies SGT5000 audio control chip
- Provides 1x MIC-in pin, 1x Line-in pin, 1x Line-out pin
- Onboard power amplifier supports 2x 5W 2Ohm speaker

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I/O

- Serial Ports: Provides 5x serial port, COM2 supports RS232/RS422/RS485; COM1, COM3-COM5 support RS232
- USB: Provides 7x USB 2.0 port, 1x standard dual USB2.0 port, 1x 2x5 2.0mm USB2.0 pin, 1x 1x5 2.0mm connector, 1x onboard USB wifi, 1x miniPCIE USB2.0 port

Expansion Port

- 1x MINI PCIe, supports WiFi、3G module
- Onboard SIM card socket, supports 3G network, and it works with MINI PCIe 3G module
- Supports 18x GPIO port

Power Support

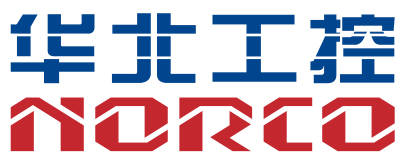
- +12V single power supply

Watchdog

- Supports hardware reset function

Operating Environment

- Operating temperature: -20~+65°C
- Storage temperature: -40~+85°C
- Operating humidity: 5%~95%, non-condensing
- Storage humidity: 5%~95%, non-condensing



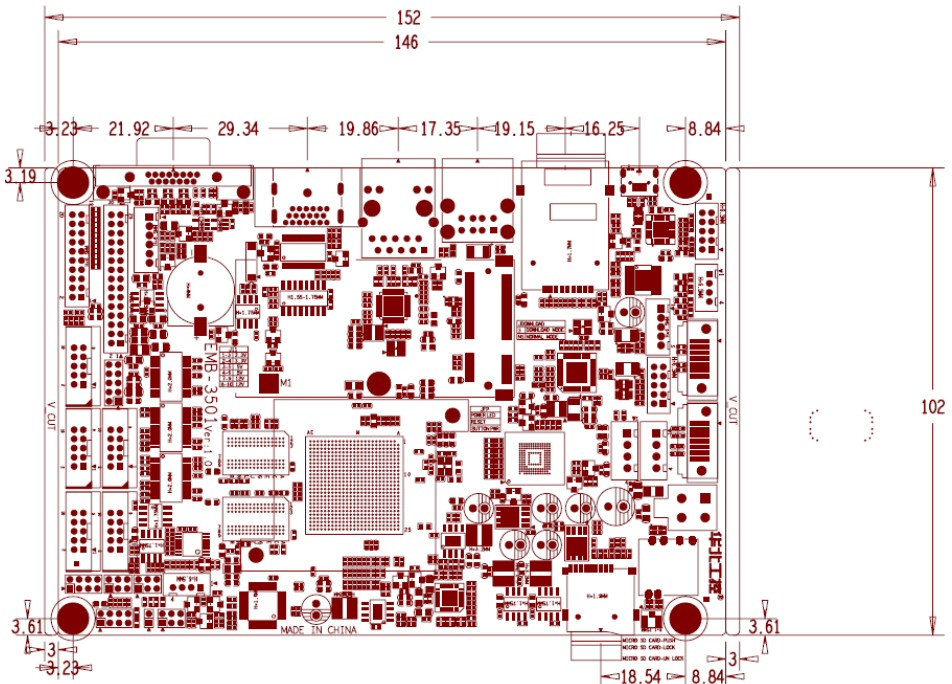
Chapter Two
Hardware Functions

Chapter Two Hardware Functions

2.1 interface location and dimensional drawing

Following is the front interface location and dimensional drawing of EMB-3501 V1.0.

Please be careful during the installation. Improper installation may lead to system failure.



Note: In case of any electrostatic damage caused to some components, please wear anti-static gloves to install the motherboard.

2.2 Installation

Please refer to following steps to assemble your computer:

1. Adjust all jumpers on board EMB-3501 V1.0 according to the user manual
2. Install other expansion card
3. Connect all signal lines, cables, control panel circuit and power supply unit

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Key components of this motherboard are Integrated circuit and these components could be easily damaged by electrostatic influence. So, before installing this unit, please always keep the following precautions in mind:

1. Hold the board by edges and don't touch any components, plugs or socket pins.
2. Wear anti-static gloves/wrist strap while touching the integrated circuit components, such as CPU, RAM, etc.
3. Put those unused or uninstalled components in static shielding bags or trays.
4. Please first check the power switch is off before connecting the power plug.

Before installing the computer accessories

Following the instructions below will help to prevent your computer from being damaged, and also ensuring your personal safety.

1. Please make sure your computer is disconnected from the power supply.
2. Please always wear anti-static strap or gloves to operate the board in case that you may touch the integrated circuit components, such as RAM.

2.3 Jumper Settings

Please refer to following instructions to do jumper settings before installing your hardware devices.

Remark: How to identify the PIN1 of all jumpers and interfaces: Please observe the mark near the plug and socket, which is a "1" or bold line or triangular symbol; And please look at the back of PCB, the one in the shape of square is the PIN 1; and PIN1 for every jumper is remarked by a white narrow near it.

2.3.1 COM2 Jumper Settings (J1、J2、J3)

(J1 , J2,J3) jumpers are used to set COM2 transmission mode, COM2 supports RS232/RS422/RS485 three modes, and you can set it according to your requirement, while the default setting is RS232.

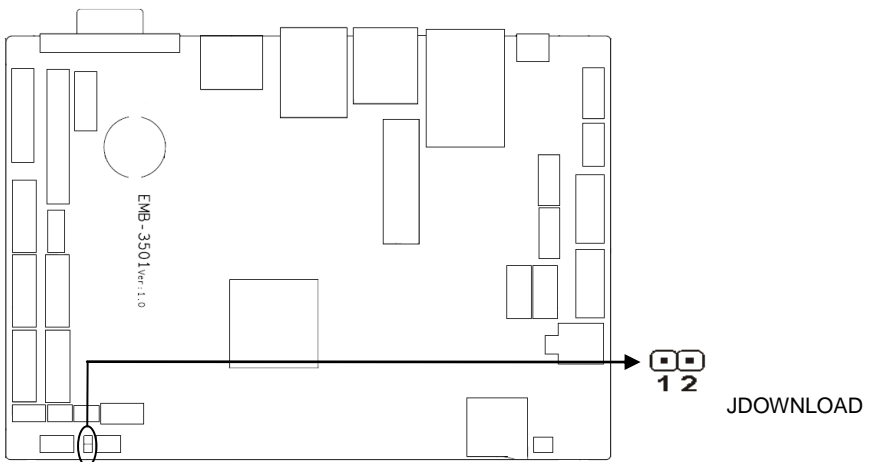
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J1, J2, J3:

COM2 AS RS232 PORT		COM2 AS RS422 PORT		COM2 AS RS485 PORT	
J1	1-3,2-4	J1	3-5,4-6	J1	3-5,4-6
J2	1-3,2-4	J2	3-5,4-6	J2	3-5,4-6
J3	1-2	J3	3-4	J3	5-6,7-8

2.3.2 Jumper (JDOWNLOAD)

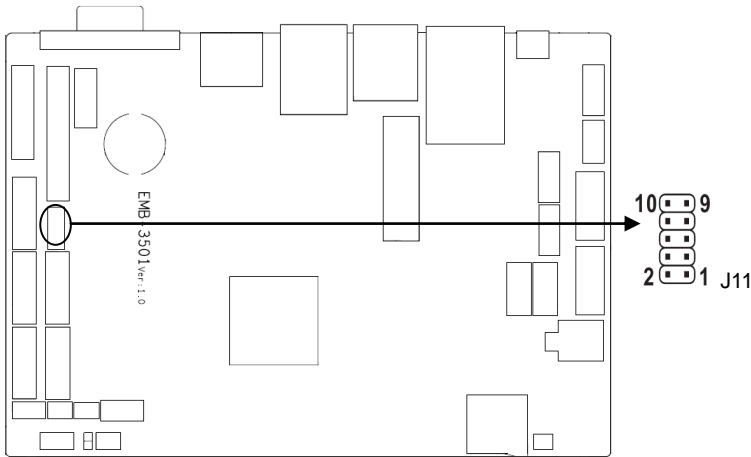


JDOWNLOAD:

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	Mode
1-2	DOWNLOAD (System Recording Mode)
NC	NORMAL (Normal Start Mode)

2.3.3 Jumper (J11)



J11:

	Mode
1-3, 2-4	LVDS power supply 3.3V
3-5, 4-6	LVDS power supply 5V
7-9, 8-10	LVDS power supply 12V

2.4 Interfaces Description

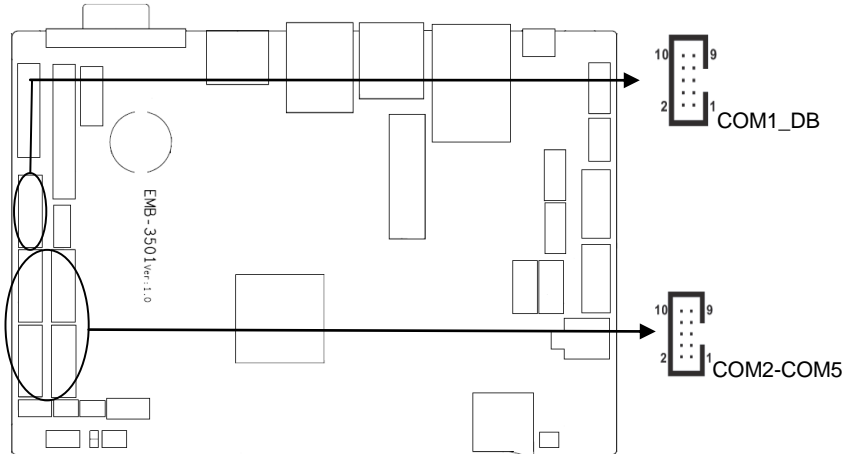
⚠ Please read this manual carefully before installing any external connectors, in case of any damage to the motherboard!

2.4.1 Serial Ports (COM1_DB、COM2_COM5)

Provides 5x serial port, and COM 2 supports RS232/RS422/ RS485 modes. COM1,

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COM3_COM5 support RS232 mode.



COM_DB:

Signal Name	Pin		Signal Name
NC	1	2	NC
RXD	3	4	RTS
TXD	5	6	CTS
NC	7	8	NC
GND	9	10	GND

COM2_COM5:

Signal Name	Pin		Signal Name
NC	1	2	NC
RXD	3	4	RTS
TXD	5	6	CTS
NC	7	8	NC
GND	9	10	GND

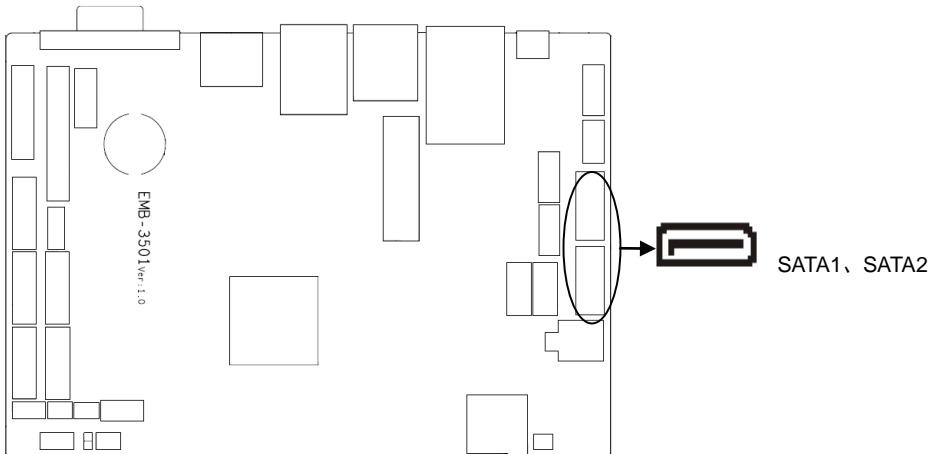
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When COM2 setting is RS232/RS422/RS485, the pins are defined as:

Pin	RS232 (default)	RS422	RS485
1	NC	TX-	DATA-
2	NC	NC	NC
3	COM_RXD	TX+	DATA+
4	COM_RTS#	NC	NC
5	COM_TXD	RX+	NC
6	COM_CTS#	NC	NC
7	NC	RX-	NC
8	NC	NC	NC
9	GND	GND	GND
10	GND	GND	GND

2.4.2 SATA Ports (SATA1、SATA2)

Provides 2x standard 7Pin SATA port.



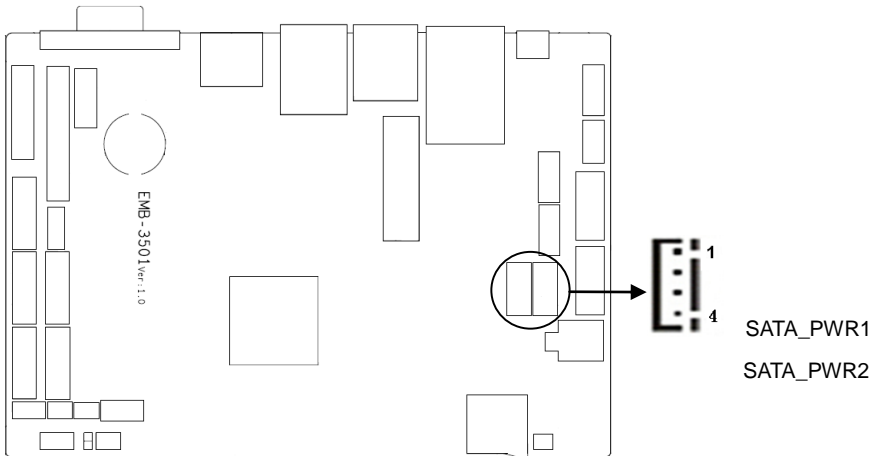
SATA:

Pin	Signal Name
1	GND
2	TX+

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3	TX-
4	GND
5	RX-
6	RX+
7	GND

2.4.3 SATA Power Port (SATA_PWR1, SATA_PWR2)



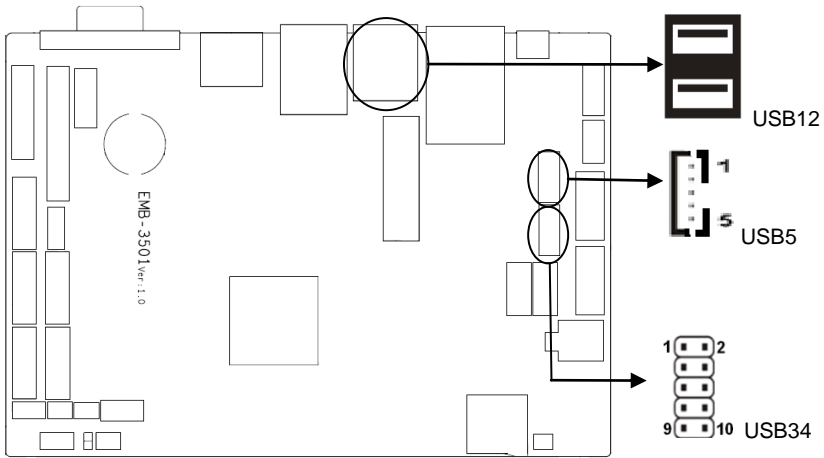
SATA_PWR1, SATA_PWR2:

Pin	Signal Name
1	+3.3V
2	GND
3	+5V
4	GND

2.4.4 USB Port (USB12, USB34, USB5)

Provides 5x USB 2.0 port, 2x standard USB2.0 port, 3x USB2.0mm pin.

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USB12:

Pin	Signal Name
1、 2	+5V
3、 4	DATA-
5、 6	DATA+
7、 8	GND

USB34:

Signal Name	Pin		Signal Name
+5V	1	2	GND
DATA-	3	4	GND
DATA+	5	6	DATA+
GND	7	8	DATA-
GND	9	10	+5V

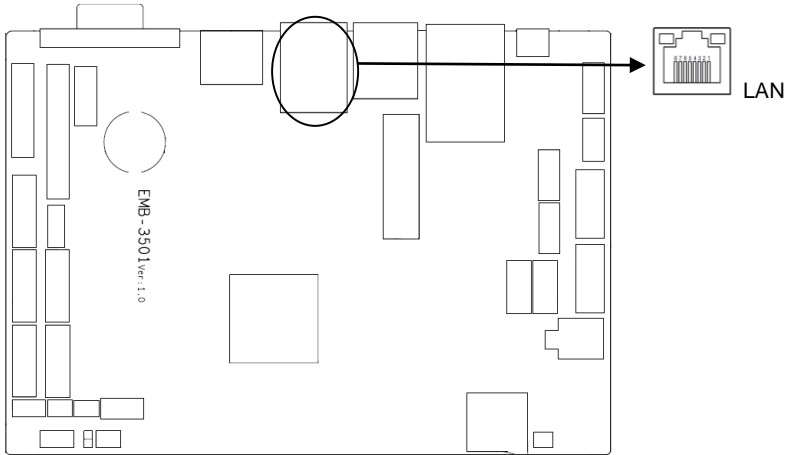
USB5:

Pin	Signal Name
1	+5V
2	DATA-
3	DATA+
4	GND
5	GND

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2.4.5 Ethernet Port (LAN)

Provides 1x RJ45 Ethernet port, and yellow is on data transmission, and green is network connected.



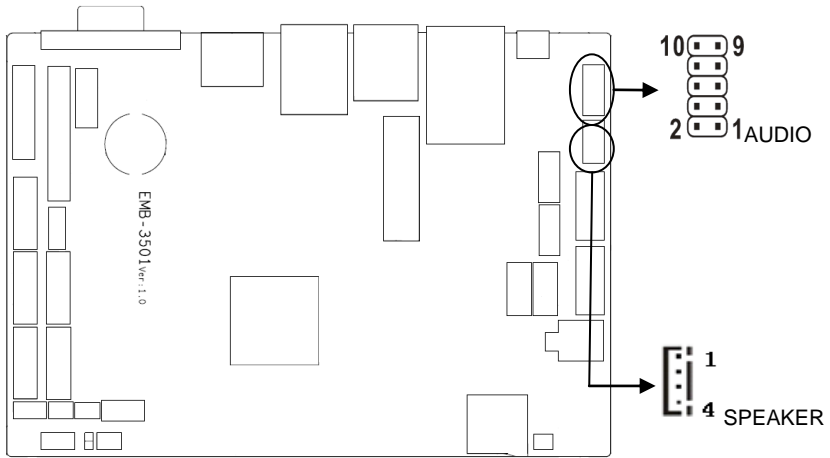
RJ45 LAN LED Status Description

LILED (Green) Status	Function	ACTLED (Yellow)	Function
ON	100/1000M link	Flash	Data transferring
OFF	10M link or closed	Off	Data stopped

2.4.6 Audio Port (AUDIO, SPEAKER)

EMB-3501 V1.0 applies SGT5000-XNAA3 audio control chip.

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AUDIO:

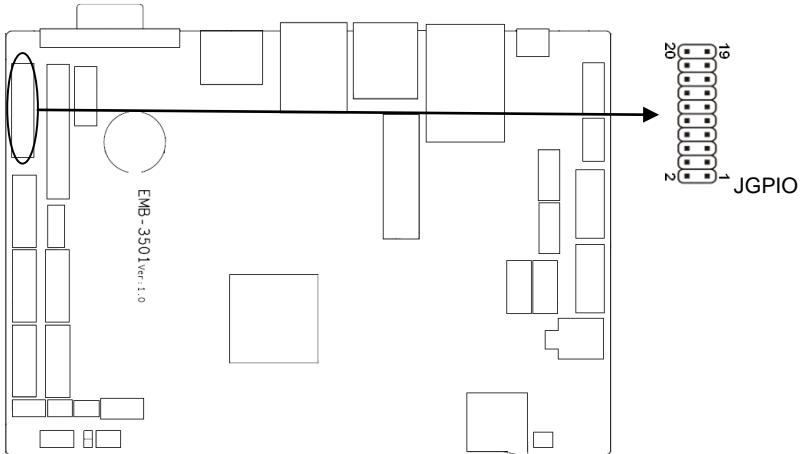
Signal Name	Pin		Signal Name
GND	1	2	MIC1
LIN_L	3	4	LIN_R
GND	5	6	GND
NC	7	8	HeadPh_R
NC	9	10	HeadPh_L

SPEAKER:

Pin	Signal Name
1	OUTPL
2	OUTNL
3	OUTNR
4	OUTPR

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2.4.7 JGPIO



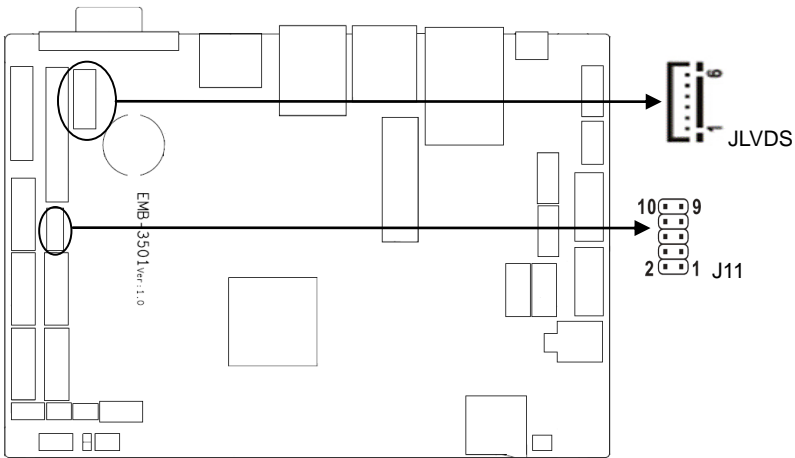
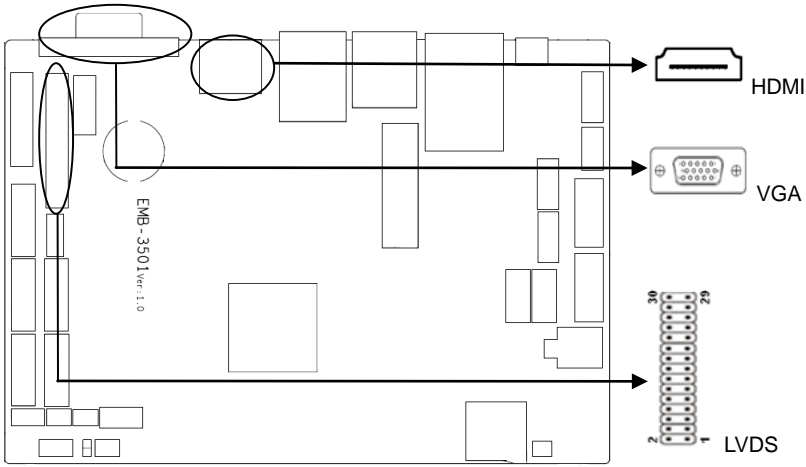
JGPIO:

Signal Name	Pin		Signal Name
GND	1	2	3.3V
GPIO1	3	4	GPIO18
GPIO2	5	6	GPIO17
GPIO3	7	8	GPIO16
GPIO4	9	10	GPIO15
GPIO5	11	12	GPIO14
GPIO6	13	14	GPIO13
GPIO7	15	16	GPIO12
GPIO8	17	18	GPIO11
GPIO9	19	20	GPIO10

2.4.7 Display Port (VGA, LVDS, HDMI, LVDS power port J11, LVDS backlight control port JLVD5)

Provides 1x VGA port, 1x dual channel LVDS port, 1 HDMI high definition display port.

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VGA:

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	RED	6	GND	11	NC

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2	GREEN	7	GND	12	SDA
3	BLUE	8	GND	13	HSYNC
4	NC	9	+5V	14	VSYNC
5	GND	10	GND	15	SCL

LVDS:

Signal Name	Pin		Signal Name
VDD	1	2	VDD
VDD	3	4	NC
GND	5	6	GND
LVDS0_TX0_N	7	8	LVDS0_TX0_P
LVDS0_TX1_N	9	10	LVDS0_TX1_P
LVDS0_TX2_N	11	12	LVDS0_TX2_P
GND	13	14	GND
LVDS0_CLK_N	15	16	LVDS0_CLK_P
LVDS0_TX3_N	17	18	LVDS0_TX3_P
LVDS1_TX0_N	19	20	LVDS1_TX0_P
LVDS1_TX1_N	21	22	LVDS1_TX1_P
LVDS1_TX2_N	23	24	LVDS1_TX2_P
GND	25	26	GND
LVDS1_CLK_N	27	28	LVDS1_CLK_P
LVDS1_TX3_N	29	30	LVDS1_TX3_P

HDMI:

Signal Name	Pin		Signal Name
D2+	1	2	D2 Shield
D2-	3	4	D1+
D1 Shield	5	6	D1-
D0+	7	8	D0 Shield
D0-	9	10	CK+
CK Shield	11	12	CK-
CE Remote	13	14	NC
DDC CLK	15	16	DDC DATA
GND	17	18	+5V

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HP DET	19	20	NC
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LVDS power supply port J11:

Signal Name	Pin		Signal Name
+3.3V	1	2	+3.3V
VDD	3	4	VDD
+5V	5	6	+5V
VDD	7	8	VDD
+12V	9	10	+12V

JLVDS (Backlight power and control):

Pin	Signal Name
1	+12V
2	+12V
3	LCD_EN
4	LCD_PWM
5	GND
6	GND

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2.4.8 (JTCH)

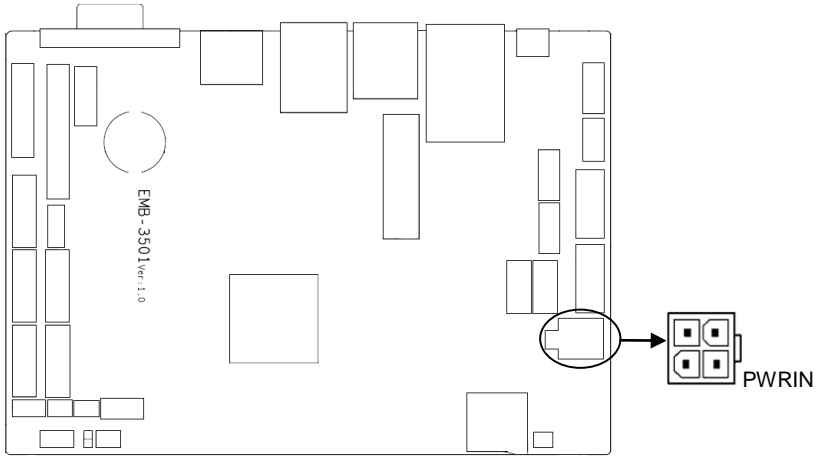


JTCH:

Signal Name	Pin		Signal Name
+3.3V	1	2	GND
LVDS1_SCL	3	4	LVDS0_SCL
LVDS1_SDA	5	6	LVDS0_SDA
EIM_CS1	7	8	EIM_D23

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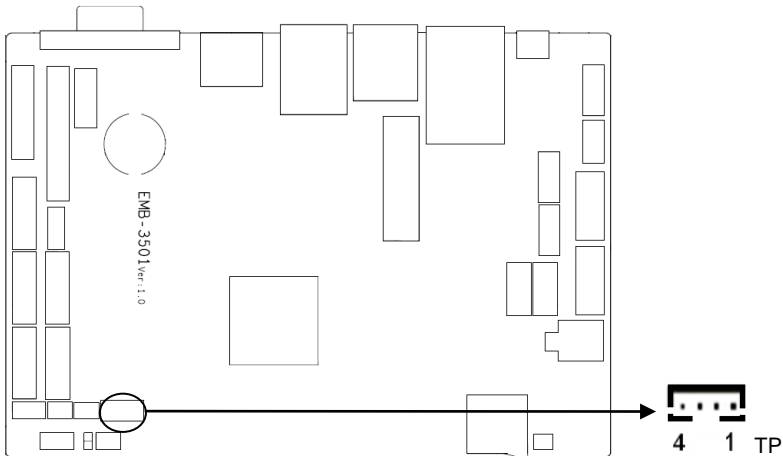
2.4.9 Power Port (PWRIN)



PWRIN:

Pin	Signal Name
1	GND
2	GND
3	+12V
4	+12V

2.4.10 Ports (TP)



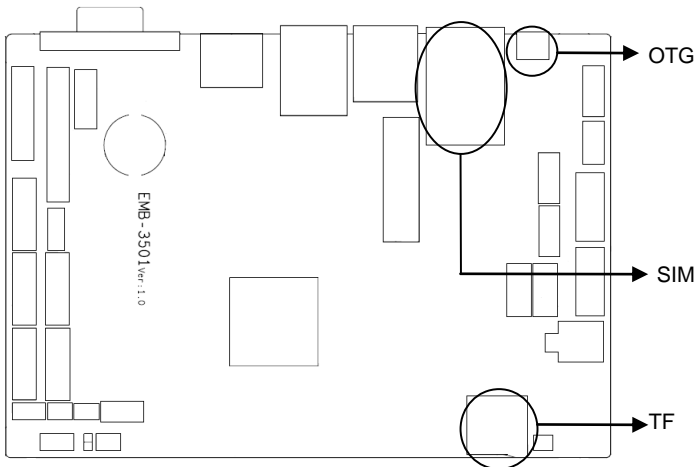
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TP:

Pin	Signal Name
1	X+
2	Y+
3	X-
4	Y-

2.4.11 Ports (OTG, TF, SIM)

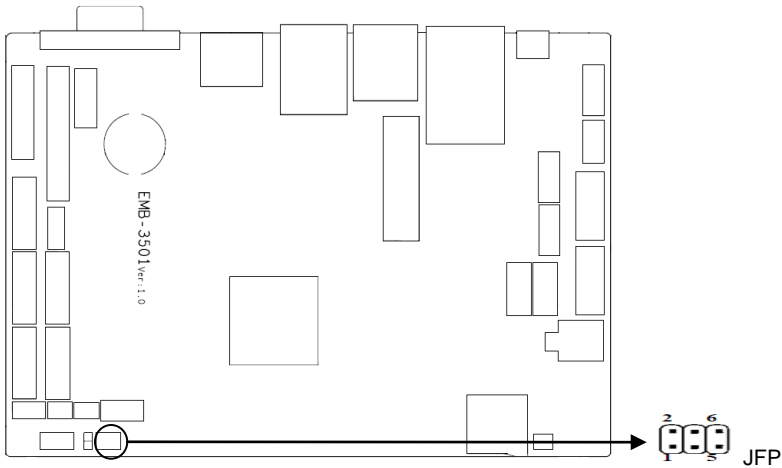
Provides 1x standard OTG port and 1x TF card port, 1x SIM card port



2.4.12 Front Panel Port (JFP)

JFP is used to connect power button and indicator on the front panel

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JFP:

Signal Name	Pin		Signal Name
LED+	1	2	LED-
RST+	3	4	RST-
PWRSW+	5	6	PWRSW-

Please connect following chart below, and pay attention to the anode (+) and cathode (-). If it is falsely connected, it may not function well.

POWER LED
RESET SW
PWR SW

1) System power LED pins (pin1, pin2 for PWLED)

Connect system power LED cable with these pins. (pin 1 is LED anode) When system is power on, power LED is on; when system is power off, power LED is off.

2) Reset Button Pins (Pin 3, Pin4 for RESET BUTTON)

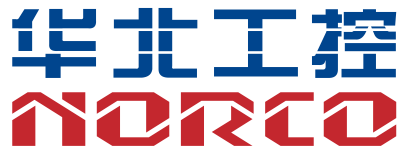
Connect the reset button cable to these two pins. When system fails, the reset button will restart the system to back to work so there is no need to turn on / off power.

3) Power ON/OFF Pins (Pin 5, Pin6 for POWER BUTTON)

Connect these two pins to the bounce switch on the chassis to connect or disconnect the power supply.

2.4.13 MINI PCIe Port

Provides 1x MINI PCIe slot, you are able to expand MINI PCIe device according to your requirement and status of WLAN card will be displayed according to the network when you use PCIe WLAN card.



Chapter Three

Software Functions

Chapter Three Software Functions

3.1 Android System

3.1.1 VGA Part

Supports vga output

Instruction: System supports VGA+HDMI dual-screen display, Connect the board to display with a VGA cable, and you can see Android display when you turn on the computer.

3.1.2 HDMI Part

Support HDMI output

Instruction: System supports VGA+HDMI dual-screen display. Connect the board to display with a HDMI cable, and you can see Android display when you turn on the computer.

3.1.3 LCD Part

Support lvds lcd port output, and customize drive according to LCD screen customer used.

3.1.4 USB Part

USB flash disk auto mounted directory: /mnt/udisk/

Instruction: Insert USB flash disk in to USB port, and open file browser to go to /mnt/udisk directory then you can check files in USB flash disk

3.1.5 COM Part

Serial port operation node: /dev/ttyxc0~/dev/ttyxc4

Instruction:

Connect serial port 2~5 to the circuit

```
busybox cp -rf com_arm/ /data/
```

```
cd /data/com_arm/
```

```
input ./c_android.sh
```

Input Baud rate and testing time

Display testing result after the program stops running

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3.1.6 TF Card Part

Tf card auto mounted directory: /dev/extsd/

Instruction: Insert TF card into TF port, and open file browser to enter /mnt/extsd directory and then you can check files in TF card.

3.1.7 SATA Hardware Part

Customize mounted directory according to customer requirement, and supports 2x SATA auto mount as default setting

Instruction: Connect SATA hard disk to board SATA port when computer is power on, and open file browser to enter /mnt/satadisk1 or /mnt/satadisk2 directory then you can check files in SATA hard disk.

3.1.8 WIFI Part

Supported, specific operation refers to android interface

Instruction: In the system open setting-> Wireless & networks-> Wi-Fi, turn on Wi-Fi, and you can see wireless router SSID on the right, connect one of them, and input router password if needed.

3.1.9 3G Part

Customize drive according to the 3G module customers used, compatible with: HUAWEI MU609, MU709, MC509, ZTE MC2716 and Long UNG U8300C.

3.1.10 Ethernet Part

Supported, specific operation refers to android interface

Instruction: In the system open setting-> Wireless & networks-> Ethernet configuration, check Ethernet, and click on Ethernet configuration, for Ethernet Devices, select eth0 for first WLAN card and select eth1 for second WLAN card, select DHCP or Static IP as Connection Type according to your requirement.

3.1.11 Sound Card Part

Supported, local sound card outputs android to switch

Instruction: HDMI plays audio or video files. Test sound output with earphone and other sound equipments.

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Local sound card: `alsa_play xx.wav`

3.2Linux System

3.2.1VGA Part

Supported

Instruction: system supports VGA+HDMI dual-screen display by default. Connect motherboard to display with a VGA cable, and you can see Linux interface when you turn on computer.

3.2.2 HDMI Part

Supports HDMI output

Instruction: Supports VGA+HDMI dual-screen display by default. Connect motherboard to display with HDMI cable, and you can see Linux display when you turn on computer.

3.2.3 LCD Part

Supports lvds lcd port output, and customize LCD screen according to customer requirement.

3.2.4 USB Part

Supported

Instruction: Insert USB flash disk to USB port, and check USB flash disk device: `fdisk -l`

Mount the USB flash disk under the system: `mount /dev/sdX1 /mnt` (sdX1 is the device name of the USB flash disk)

Enter USB flash disk directory to operate files in USB flash disk: `cd /mnt`

3.2.5 COM Part

Device node: `/dev/ttymx0~/dev/ttymx4`

Instruction: Connect serial port 2~5 to the circuit

```
busybox cp -rf com_arm/ /data/
```

```
cd /data/com_arm/
```

```
Input ./c_linux.sh
```

```
Input Baud rate and testing time
```

```
Display testing result after the program stops running
```

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3.2.6 TF Card Part

Supported, and it needs to be mounted and tested

Instruction: Insert TF card into USB port, and check USB flash disk device: `fdisk -l`

Mount TF card under system: `mount /dev/mmcblk1p1 /mnt`

Enter TF card directory and operate on files in TF card: `cd /mnt`

3.2.7 SATA Hardware Part

Supported, and it needs to be mounted and tested

Instruction: Connect hard disk to SATA port when power off, and check hardware device: `fdisk -l`

Mount SATA hard disk under system: `mount /dev/sdX1 /mnt` (sdX1 is SATA hard disk device)

Enter SATA hard disk directory and operate on files in hard disk

3.2.8 WIFI Part

Supported, and it needs to be iwlist iwconfig tested

Instruction:

Acquire every applicable AP: `iwlist wlan0 scan`

Connect wireless AP: `iwconfig wlan0 essid xxxx`

Set wlan0 IP address: `iwconfig wlan0 xx.xx.xx.xx`

ping route: `ping xx.xx.xx.xx`

3.2.9 3G Part

Customize drive according to 3G module customer used.

3.2.10 Ethernet Part

Supported, and it needs to be tested with `ifconfig dhcp ping`

Instruction:

Check WLAN card device: `ifconfig -a`

Allocate WLAN card static IP address `ifconfig ethX X.X.X.X` or use dynamic allocation:

`dhclient ethX`

Ping route: `ping xx.xx.xx.xx`

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3.2.11 Sound Card Part

Supported, it needs to be tested with alsactl tool

Instruction:

Check sound card device: `aplay -l`

Run alsamixer, and turn the Speaker and PCM to maximum, and play audio files: `aplay XX.wav`

Designated to use HDMI audio: `aplay -D hw:2,0 XX.wav`



Appendix

Appendix

Appendix: Glossary

ACPI

Advanced Configuration and Power Management. ACPI specifications allow operating system to control most power of the computer and its add-ons. Windows 98/98SE, Windows 2000 and Windows ME supports this specification.

BIOS

Basic input/output system. It is software including all in/out control code interface in PC. The software will detect hardware when it auto boot, operate OS, and provide an interface between OS and hardware. BIOS is stored in a ROM chip.

BUS

BUS is a channel for different devices to exchange data in computer system. It is hardware circuit. BUS here refers to partial lines inside CPU and the main components of system memory.

Chipset

Chipset is a Integrated set of chips for executing one or more related functions. Here it refers to a system level chipset structured by Southbridge & Northbridge; Chipset decides the structure and main functions of motherboard. . .

CMOS

Complementary Metal-Oxide Semiconductor, which is a widely used semiconductor with the characteristics of high-speed and low-power. COMS here refer to part of space on-board CMOS RAM for saving date, time, system information and system parameter, ect.

COM

Computer-Output Microfilmer. A universal serial communication interface, usually adopts normative DB 9 connector.

DIMM

Dual-Inline-Memory-Modules. It is a small circuit board with memory chipset providing 64 bit memory bus width.

DRAM

Dynamic Random Access Memorizer. It's a general type of memory for regular computer

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which usually store 1 bit with a transistor and a capacitance. With the development of the technology, more and more types of DRAM with different specifications exist in computer applications. For example: SDRAM/DDR SDRAM/RDRAM.

LAN

Network interface. Network grouped by correlative computers in a small area, generally in a company or a building. Local area network is buildup by sever, workstation, some communications links. Terminals can access data and devices anywhere through cables, which enables users to share costly devices and resource.

LED

Light-Emitting Diode. A semiconductor device that lighted when power supply is connected, It is often used to indicate information directly, for example, to indicate power on or HDD working normally.

PnP

Plug-and-Play. It is a specification that allows PC to configure its external devices automatically and it works independently without the manual operation. To achieve this function, BIOS should be able to support PnP and a PnP expansion card

POST

Self-test when power on. While the system is booting, BIOS will keep testing the system which including RAM, keyboard, hard disk driver to check if all the components are connected directly and function well.

PS/2

A keyboard & mouse connective interface specification developed by IBM.PS/2 is a DIN interface with only 6PIN; it also can connect other devices, like modem

USB

It is the Universal Serial Bus for short. A hardware interface adapts to low speed peripherals, and is always used to connect keyboard, mouse etc. One PC can connect maximum 127 USB devices, providing 12Mbit/s transmit bandwidth USB supports hot swap and multi- data stream, namely, you can plug USB devices while system is running, system can auto-detect and makes it work on.



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