# Product Specification

**Item No.**: BTP-PCM-A-022A

**Product Name**：All-in-one Rockchip RK3588 Solution Android Development Motherboard

**Version :** V

**Version History**

| Version | Description | Date |
|---|---|---|
| V1.0 | Established | 2021/05/10 |
| | | |

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# Part 1

## 1.1 Product Overview

022A board adopts Rockchip RK3588 high-performance, octa-core 64-bit processor (4xA76+4xA55) 8nm LP process technology with a maximum frequency of 2.4GHz, integrated GPU/VPU/NPU ARM Mali-G610 quad-core GPU, VPU 8K@ 60fps H.265/H.264/VP9 video decoding NPU computing power 6Tops, 8K video codec, clearer images, support Android12.0 system Debian11 and other operating systems. Multi-channel input and output, multi-screen different display, Ethernet, HDMI-IN/OUT, WIFI6, BT5.2 power amplifier integrated, rich expansion interface, simplify the design of the whole machine system, widely used in ARM PC, edge computing, cloud Fields such as servers, smart NVRs, smart large screens, and smart cars .

## 1.2 Key Features

◆ High integration. Integrate functions such as USB/LVDS/Gigabit Ethernet/WIFI6/BT5.2/eDP expansion/microphone, etc., simplify the design of the whole machine, and the design of the whole machine is more beautiful.

◆ 8K@60fpsH.265/VP9/AVS28K@60fpsH.264/AVC/MVC4K@60fps AV1 and other video encoding and various LVDS/eDP/MIPI signal LCD display.

◆ Support HDMI IN/OUT

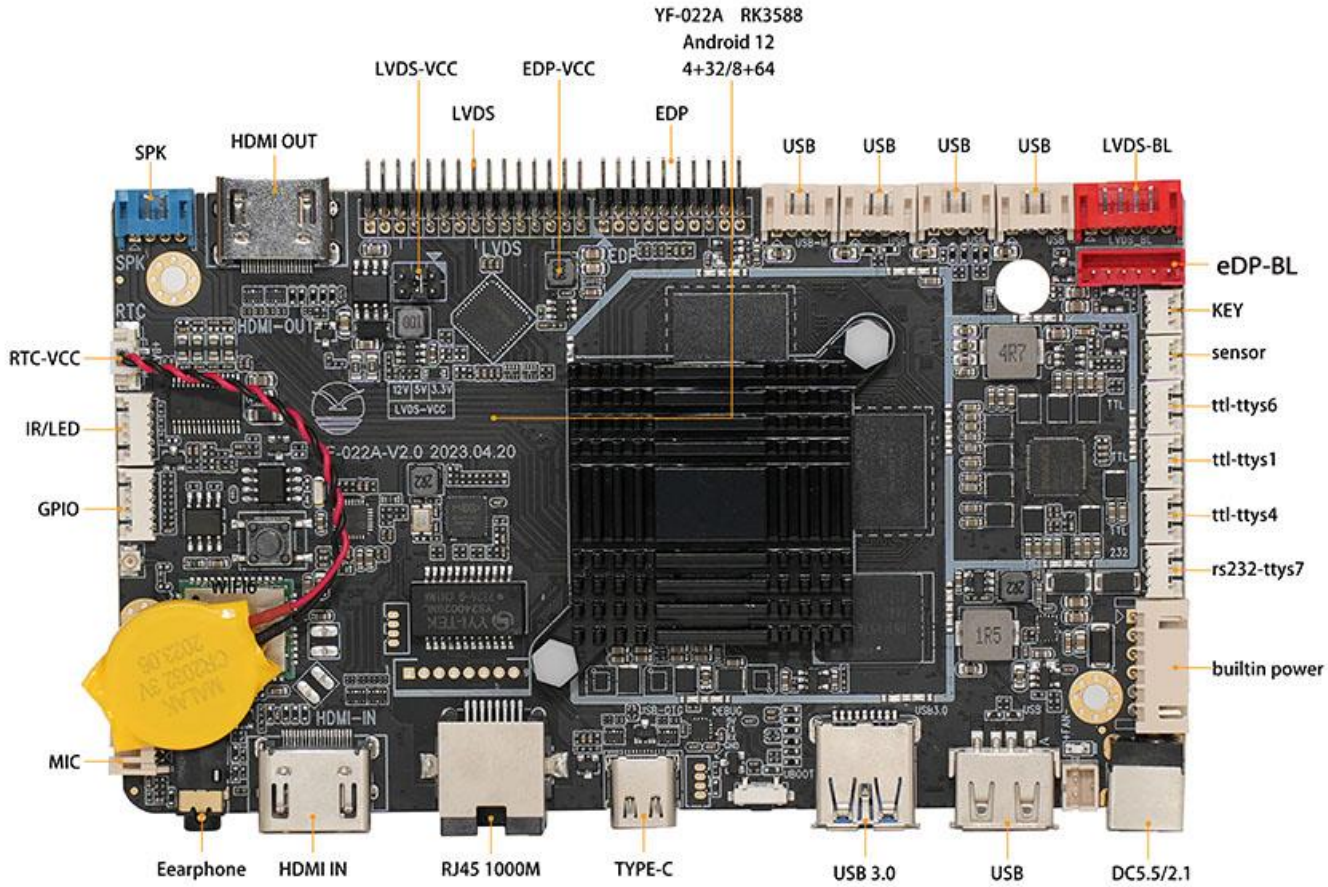
◆ Built-in power amplifier. Support dual channel 8R/5W power amplifier.

◆ Rich interfaces. Support USB (2-way USB3.0)/serial port/GPIO/ADC interface expansion, which can meet the mainstream peripherals on the market.

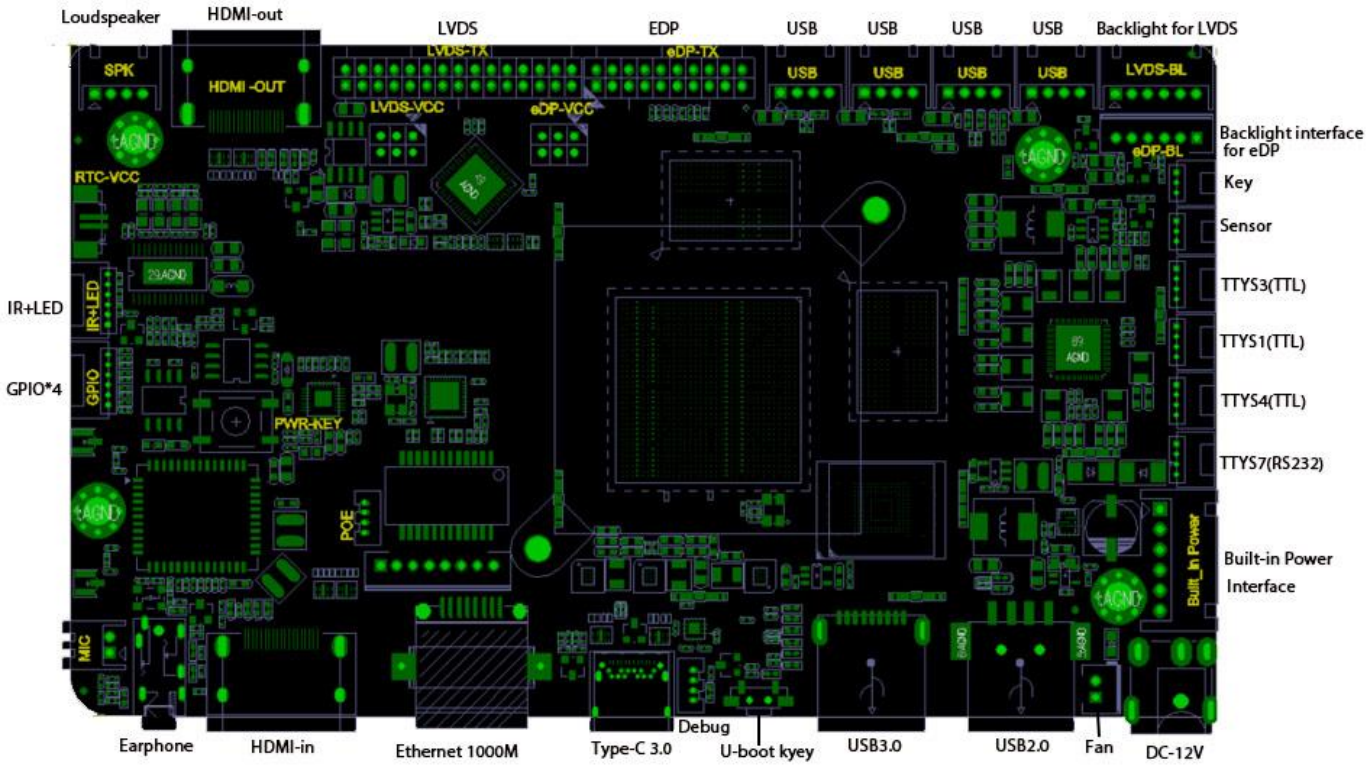
◆ Fully functional. Support horizontal and vertical screen playback, video split screen, scrolling subtitles, timer switch, USB data import and other functions.

◆ Easy to manage: Humanized playlist making software is convenient for advertising management and control. Play log, easy to understand the playback situation

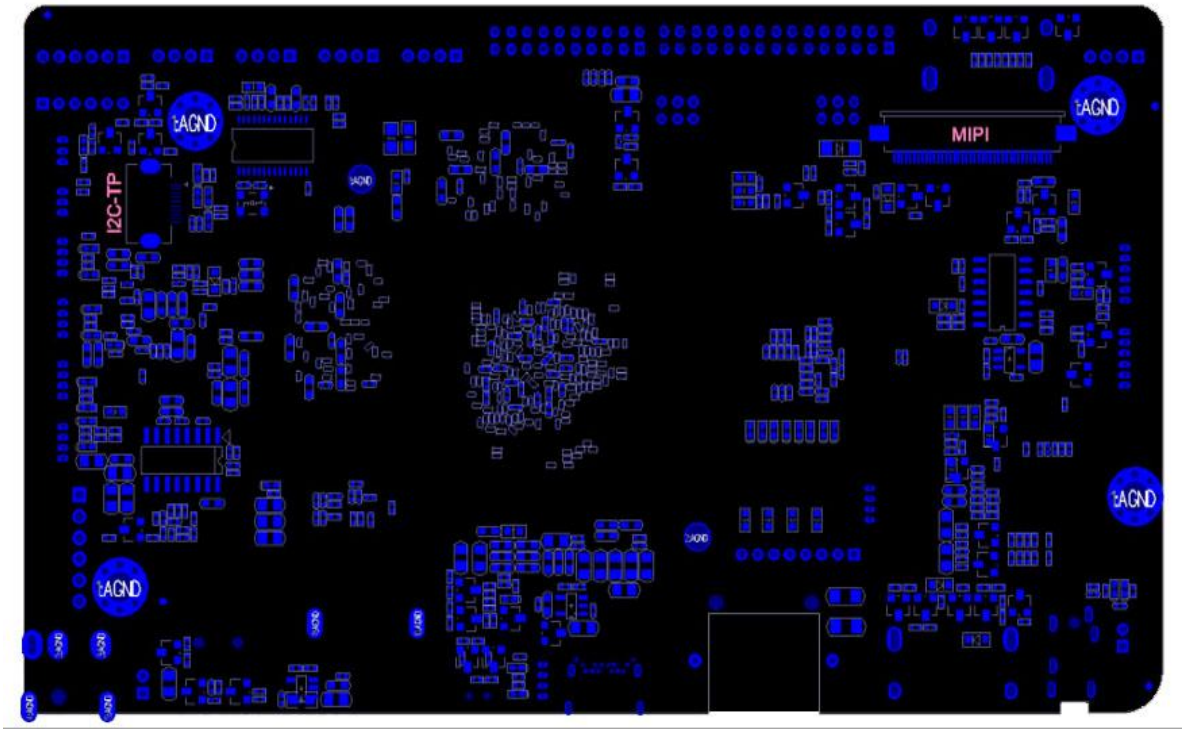
## 1.3 Layout and interface Diagram



## Front:




## backside:



# Part 2

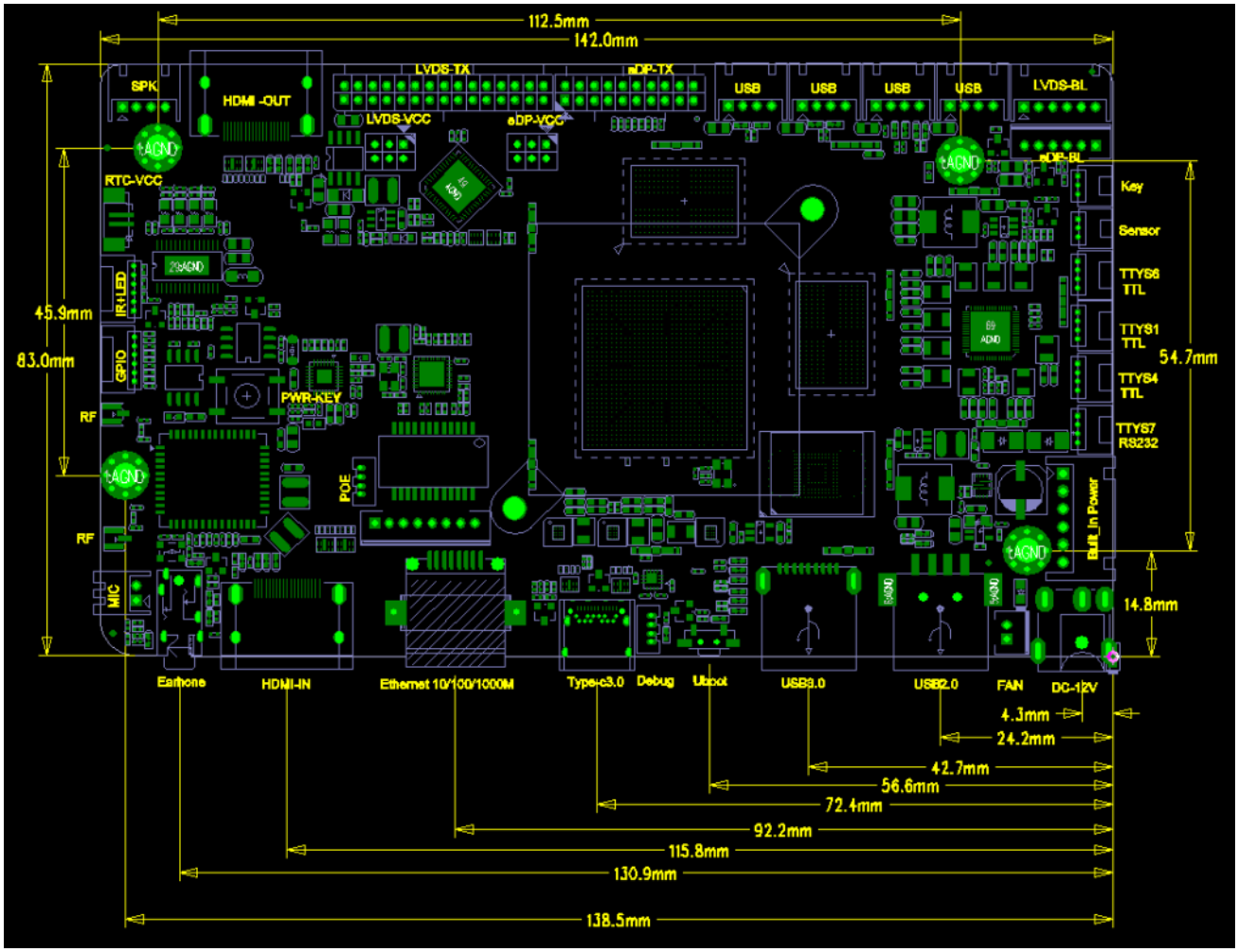
## 2.1 Hardware Specification

| Hardware Spec | |
|---|---|
| CPU | Rockchip 3588, 8 core （4×Cortex-A76+4×Cortex-A55） 64bit, 8nm advanced tech, main frequency up to 2.4GHz； |
| GPU | ARM Mali-G610 MP4 quad-core GPU support OpenGL ES3.2 / OpenCL 2.2 / Vulkan1.1, 450 GFLOP |
| NPU | The NPU computing power is up to 6 TOPS, supports INT4/INT8/INT16 mixed computing, and can realize network model conversion based on TensorFlow / MXNet / PyTorch / Caffe and other series of frameworks |
| RAM | 4GB/8GB/16GB 64bit LPDDR4/LPDDR4x （UP TO 32GB） |
| ROM | 32GB/64GB/128GB eMMC STANDARD 32G |
| Decoding resolution | Video decoding:<br>8K@60fps H.265/VP9/AVS2 8K@30fps H.264 AVC/MVC<br>4K@60fps AV1 1080P@60fps MPEG-2/-1/VC-1/VP8<br>Video encoding: 8K@30fps encoding, support H.265 / H.264<br>*Up to 32 channels of 1080P@30fps decoding and 16 channels of 1080P@30fps encoding |
| OS | Android12.0, Linux Debian 11 |
| Type-C | Full Function (except PD) |
| Play mode | Supports multiple playback modes such as loop, timing, and insertion |
| Network | Fast Ethernet, support WiFi/BT5.2, wireless peripheral expansion |
| USB2.0 Ports | 1way USB HOST，4 built-in USB |
| USB 3.0 | 1way standard USB 3.0 |
| USB-OTG | USB-OTG Type-c2.0 |
| HDMI out | HDMI2.1（8K@60fps Or 4K@120fps） |
| HDMI in | UP To 3840*2160 30HZ |
| Ethernet | 1 way 100M/1000M Adaptive Ethernet |
| EDP Output | Up to 7680x4320@60Hz |
| LVDS | Up to 1920*1080 |
| MIPI | Up to 2560*1440 |
| Audio output | Left and right channel output 8R/5W speakers |
| RTC | support |
| Hardware watch-dog | support |
| Timer switch | Support |

| | |
|---|---|
| Serial port | 3 x TTL，1 x Debug，1 x RS232 |
| Multi-screen display | Support, up-to three screen display |
| OS updating | Support TF card/USB |
| Other function | Automatically import screen parameters through USB/TF |

# Part 3

# 3.1 PCB Size




PCB：6 layers

Size ： 135*90*1.6mm

Screw hole： ∮3.5mm x 4

# 3.2 Interface Pin Map

## 1 BAT1 RTC battery interface (J2)

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | RTC | Input | 3.3V Input |
| 2 | GND | ground | ground |

## 2 LED+IR remote indicator 6P-1.25(CON8)

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | LED-R | red light | 关机指示 |
| 2 | GND | ground | ground |
| 3 | LED-G | green light | 开机指示 |
| 4 | IR-VCC | IR-VCC | IR-VCC power |
| 5 | GND | ground | ground |
| 6 | IR | IRsignal | IRsignal |

## 3 TP interface (JP2-10P/0.5 Interval)

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | GND | ground | ground |
| 2 | GND | ground | ground |
| 3 | RST | Input/output | 复位 |
| 4 | INT | Input/output | 中断 |
| 5 | GND | ground | ground |
| 6 | SCL | clock | clock |
| 7 | SDA | data | data |
| 8 | VCC | power | V3.3 power |
| 9 | GND | ground | ground |
| 10 | GND | ground | ground |
| | | | |

## 4 Serial ports *3 (CON6/CON7/CON10)TTL

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | VCC-3.3V | output | 3.3Voutput |
| 2 | UART-TX | Input/output | dataInput/output |
| 3 | UART-RX | Input/output | dataInput/output |
| 4 | GND | ground | ground |
| | | | |

## 5 Serial port (CON5) RS232

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | VCC-5V | output | 5Voutput |
| 2 | UART-TX | Input/output | dataInput/output |
| 3 | UART-RX | Input/output | dataInput/output |
| 4 | GND | ground | ground |

## 6 Loudspeaker（CON12）

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | OUTL+ | output | Audiooutputleft+ |
| 2 | OUTL- | output | Audiooutputleft- |
| 3 | OUTR- | output | Audiooutput 右- |
| 4 | OUTR+ | output | Audiooutput 右+ |

## 7 MIC interface (MIC1)

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | MCIN | Input | MICnegative |
| 2 | MCIP | Input | MICpositive |

## 8 Backlight control interface for eDP（CON1）

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | VCC | power | 12Voutput |
| 2 | VCC | power | 12Voutput |
| 3 | BL-EN | output | backlight enable control |
| 4 | BL-ADJ | output | 背光亮度控制 |
| 5 | GND | ground | ground |
| 6 | GND | ground | ground |

## 9 Backlight control interface for LVDS（CON16）

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | VCC | power | 12Voutput |
| 2 | VCC | power | 12Voutput |
| 3 | BL-EN | output | backlight enable control |
| 4 | BL-ADJ | output | Backlight brightness control |
| 5 | GND | ground | ground |
| 6 | GND | ground | ground |

## 10 I/O interface 6P-1.25(CON2)

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | VCC | power | 3.3Voutput |
| 2 | I/O | Input/output | GPIO-1 |
| 3 | I/O | Input/output | GPIO-2 |
| 4 | I/O | Input/output | GPIO-3 |
| 5 | I/O | Input/output | GPIO-4 |
| 6 | GND | ground | ground |

## 11 I/O interface 3P-1.25 (CN2)

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | I/O | Input/output | Sensor |
| 2 | GND | ground | ground |
| 3 | VCC | power | +5Voutput |

## 12 Key interface 3P-1.25 (J1)

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | PWR | switchkey | switchkey |
| 2 | ADKey | ADKey | ADKey |
| 3 | GND | ground | ground |

## 13 USB Built-in (CON26,CON13,CON14,CON17)

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | USB-5V | output | 5Voutput |
| 2 | DM | Input/output | Data Input/output |
| 3 | DP | Input/output | Data Input/output |
| 4 | GND | ground | ground |

## 14 LVDS interface (CON15)

| No. | Definition | property | Description |
|---|---|---|---|
| 1 | PVCC | poweroutput | Poweroutput to LCD panel，+3.3V/+5V/ +12V optional, setup by adjusting the jumper on CN1 |
| 2 | | | |
| 3 | | | |
| 4 | GND | ground | ground |
| 5 | | | |
| 6 | | | |
| 7 | RXO0- | output | Pixel0 Negative Data (Odd) |
| 8 | RXO0+ | output | Pixel0 Positive Data (Odd) |
| 9 | RXO1- | output | Pixel1 Negative Data (Odd) |
| 10 | RXO1+ | output | Pixel1 Positive Data (Odd) |
| 11 | RXO2- | output | Pixel2 Negative Data (Odd) |
| 12 | RXO2+ | output | Pixel2 Positive Data (Odd) |
| 13 | GND | ground | ground |
| 14 | GND | ground | ground |
| 15 | RXOC- | output | Negative Sampling Clock (Odd) |
| 16 | RXOC+ | output | Positive Sampling Clock (Odd) |
| 17 | RXO3- | output | Pixel3 Negative Data (Odd) |
| 18 | RXO3+ | output | Pixel3 Positive Data (Odd) |
| 19 | RXE0- | output | Pixel0 Negative Data (Even) |
| 20 | RXE0+ | output | Pixel0 Positive Data (Even) |
| 21 | RXE1- | output | Pixel1 Negative Data (Even) |
| 22 | RXE1+ | output | Pixel1 Positive Data (Even) |
| 23 | RXE2- | output | Pixel2 Negative Data (Even) |
| 24 | RXE2+ | output | Pixel2 Positive Data (Even) |
| 25 | GND | ground | ground |
| 26 | GND | ground | ground |
| 27 | RXEC- | output | Negative Sampling Clock (Even) |
| 28 | RXEC+ | output | Positive Sampling Clock (Even) |
| 29 | RXE3- | output | Pixel3 Negative Data (Even) |
| 30 | RXE3+ | output | Pixel3 Positive Data (Even) |

## 15 MIPI interface （CN1）

| Pin | Symbol | Function |
|---|---|---|
| 1 | NC | No connection |
| 2 | VDD | Power supply VDDIN=3.3V |
| 3 | VDD | Power supply VDDIN=3.3V |
| 4 | GND | Groud |
| 5 | RESET | Global reset signal(3.3) |
| 6 | NC | No connection |
| 7 | GND | Groud |
| 8 | D0N | 0- MIPI Differential data |
| 9 | D0P | 0+MIPI Differential data |
| 10 | GND | Groud |
| 11 | D1N | 1- MIPI Differential data |
| 12 | D1P | 1+MIPI Differential data |
| 13 | GND | Groud |
| 14 | CLKN | -MIPI Differential clock data |
| 15 | CLKP | +MIPI Differential clock data |
| 16 | GND | Groud |
| 17 | D2N | 2- MIPI Differential data |
| 18 | D2P | 2+MIPI Differential data |
| 19 | GND | Groud |
| 20 | D3N | 3- MIPI Differential data |
| 21 | D3P | 3+MIPI Differential data |
| 22 | GND | Groud |
| 23 | NC | No connection |
| 24 | NC | No connection |
| 25 | GND | Groud |
| 26 | NC | No connection |
| 27 | NC | No connection |
| 28 | NC | No connection |
| 29 | NC | No connection |
| 30 | GND | Groud |
| 31 | LED- | LED Cathode |
| 32 | LED- | LED Cathode |
| 33 | NC | No connection |
| 34 | NC | No connection |
| 35 | NC | No connection |
| 36 | NC | No connection |
| 37 | NC | No connection |
| 38 | NC | No connection |

| | | |
|---|---|---|
| 39 | LED+ | LED Anode |
| 40 | LED+ | LED Anode |

## 16 eDP interface（CN11）

| Pin No. | Definition | Property | 描述 |
|---|---|---|---|
| 1 | PVCC | Power output | LCD Panel Power output，+3.3V　R864 3.3V/R865 10V |
| 2 | PVCC | Power output | LCD Panel Power output，+3.3V　R864 3.3V/R865 10V |
| 3 | GND | Ground | Ground |
| 4 | GND | Ground | Ground |
| 5 | Lane0_n | data output | Complement Signal-Lane0 |
| 6 | Lane0_p | data output | True Signal-Main Lane0 |
| 7 | Lane1_n | data output | Complement Signal-Lane1 |
| 8 | Lane1_p | data output | True Signal-Main Lane1 |
| 9 | Lane2_n | data output | Complement Signal-Lane2 |
| 10 | Lane2_p | data output | True Signal-Main Lane2 |
| 11 | Lane3_n | data output | Complement Signal-Lane3 |
| 12 | Lane3_p | data output | True Signal-Main Lane3 |
| 13 | GND | Ground | Ground |
| 14 | GND | Ground | Ground |
| 15 | AUX_N | data output | Complement Signal-Auxiliary Channel |
| 16 | AUX_P | data output | True Signal-Auxiliary Channel |
| 17 | GND | Ground | Ground |
| 18 | GND | Ground | Ground |
| 19 | GND | Ground | Ground |
| 20 | HPD | HPD | HPD |

## 17 Other Interface Function:

| | | |
|---|---|---|
| Storage interface | TF card | Data saving, up to 128GB |
| | USB | HOST interface support data saving and importing, USB mouse and keyboard camera, touch screen, etc |
| Ethernet | RJ45 interface | Support wire network |
| HDMI interface | Standard | Support HDMI output, up to 4K |
| TF | Standard interface | TF 128G |

# Part 4

### 4.1 Electricity property

| Item | | min | classic | Max |
|---|---|---|---|---|
| Power Voltage | Voltage | -- | 12 | -- |
| | Wave | -- | -- | 50mV |
| Current (HDMI output, no other output) | Work current | -- | 250mA | 300mA |
| | Standby current | -- | 32mA | 70mA |
| | USB current supply | -- | -- | 500mA |
| | Current to Panel | -- | -- | 1A |
| enviroment | Relative Humidity | -- | -- | 80% |
| | Temperature | -20℃ | -- | 70℃ |

Remark 1: When connecting to an LVDS screen, care should be taken to select the correct backlight operating voltage of 3.3V, 5V, 12V, and users should not apply it to peripherals that exceed the corresponding maximum current.

# Part 5

## 5.1: Cautions for Assembling

- During assembly and use, please pay attention to the following (and not limited to) problems.
- Short circuit problem between bare board and peripherals.
- during the installation and fixation process, avoid deformation problems of the bare board due to fixation.
- To install the LVDS LCD Panel, pay attention to whether the LCD Panel Voltage and current are correct. Pay attention to the direction of pin 1 of the LCD Panel Interface.
- To Install the LVDS LCD Panel, pay attention to whether the LCD Panel backlight Voltage and current are correct. When LCD Panel backlight power is above 20W, please use external Power boards for power supply.
- To Install peripherals (USB, IO), pay attention to the peripheral IO level and current Output issues.
- To Install Device to the serial port, pay attention to whether the RS232, 485 device is directly connected, and whether the TX and RX connected correctly.
- Check whether Input Power is connected to the Power Input interface. check whether Power Voltage and current meet the requirements, according to the total peripheral evaluation
- It is forbidden to connect the power supply to the backlight socket for the convenience of operation.