

# Mini3588 Reference User Manual

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**Boardcon Embedded Design**

[www.armdesigner.com](http://www.armdesigner.com)

## **1. Introduction**

### **1.1. About this Manual**

This manual is intended to provide the user with an overview of the board and benefits, complete features specifications, and set up procedures. It contains important safety information as well.

### **1.2. Feedback and Update to this Manual**

To help our customers make the most of our products, we are continually making additional and updated resources available on the Boardcon website ([www.boardcon.com](http://www.boardcon.com) , [www.armdesigner.com](http://www.armdesigner.com)).

These include manuals, application notes, programming examples, and updated software and hardware. Check in periodically to see what's new!

When we are prioritizing work on these updated resources, feedback from customers is the number one influence, if you have questions, comments, or concerns about your product or project, please no hesitate to contact us at [support@armdesigner.com](mailto:support@armdesigner.com).

### **1.3. Limited Warranty**

Boardcon warrants this product to be free of defects in material and workmanship for a period of one year from date of buy. During this warranty period Boardcon will repair or replace the defective unit in accordance with the following process:

A copy of the original invoice must be included when returning the defective unit to Boardcon. This limited warranty does not cover damages resulting from lightning or other power surges, misuse, abuse, abnormal conditions of operation, or attempts to alter or modify the function of the product.

This warranty is limited to the repair or replacement of the defective unit. In no event shall Boardcon be liable or responsible for any loss or damages, including but not limited to any lost profits, incidental or consequential damages, loss of business, or anticipatory profits arising from the use or inability to use this product.

Repairs make after the expiration of the warranty period are subject to a repair charge and the cost of return shipping. Please contact Boardcon to arrange for any repair service and to obtain repair charge information.



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# 1 Mini3588 Introduction

## 1.1 Summary

The Mini3588 system-on-module is equipped with Rockchip's RK3588, which features a quad-core Cortex-A76 and quad-core Cortex-A55 processor, an Embedded Mali-G610 MP4 GPU, and a 6.0 TOPs NPU.

It is designed specifically for high-performance devices such as 8K TV boxes or recorders, VI devices, intelligent interactive devices, personal computers, and robots. The high-performance multimedia processing and acceleration engine solution can help customers introduce new technologies more quickly and enhance the overall solution efficiency.

## 1.2 Features

- **Microprocessor**
  - Quad-core Cortex-A76 up to 2.3GHz
  - Quad-core Cortex-A55 up to 1.8GHz
  - 64KB I-cache 64KB D-cache and 512KB L2 for A76 each core, 32KB I-cache 32KB D-cache and 512KB L2 for A55 each core, 3MB L3 cache
  - 6.0 TOPs Neural Process Unit, Embedded 384KB\*3 internal buffer
  - Mali-G610 MP4 up to 0.8GHz
- **Memory Organization**
  - LPDDR4 or LPDDR4X RAM up to 16GB
  - eMMC up to 256GB
- **Boot ROM**
  - Supports system code download through USB OTG
- **Secure system**
  - Embedded two cipher engine
  - Support key ladder to guarantee key secure
  - Support secure OS and data scrambling
  - Support OTP
- **Video Decoder/Encoder**
  - Supports video decoding up to 8K@60fps
  - Supports H.264/265 encode up to 8K@30fps
  - H.264 HP encoding up to 1080p@100fps
  - Picture size up to 8192x8192
- **NPU**
  - Include Triple NPU core
  - Support deep learning frameworks
- **Display Subsystem**
  - **Video Output**
    - Supports 2-CH HDMI 2.1 TX with ARC, up to 8K@60fps



or EDP TX interface up to 4K@60Hz  
HDMI 2.1 support FRL mode  
Supports 2-CH 4 lanes MIPI DSI up to 4K@60Hz  
Supports 2-CH PD1.4a interface up to 8K@30Hz  
Supports BT-1120 16bit output

- **Video/Image Input**

Supports 2-CH MIPI 4lanes CSI interfaces  
Or 4-CH MIPI 2lanes  
Supports total 6-CH 2lanes CSI interfaces  
Supports DVP 8/16-bit input

• **Audio**

- Three I2S/PCM interfaces  
- Support 8-ch TX/RX on I2S0/1  
- Support Mic array Up to 8ch PDM/TDM interface  
- Two SPDIF output  
- Support voice activity detection

• **USB / PCIE/SATA3**

- Two USB2.0 OTG/Host and two USB2.0 Host interfaces  
- Two USB3.0 OTG/Host or DP interfaces  
- Three USB3.0 Host interface.  
- Three PCIE2.1 x1 or SATA3 interface.  
- Two PCIE3.0 x2 or One PCIE3.0 x4 interface  
- Not support USB3.0/USB2.0 OTG SRP, HNP and RSP  
- SATA3 support five device each port via PM switch

• **Ethernet**

- On board RTL8211F  
- Support up to 2-CH 1GB Ethernet  
- Support RMII/RGMII PHY interface

• **I2C**

- Up to 7-CH I2C  
- Support standard mode and fast mode(up to 400kbit/s)

• **SDIO / SDMMC**

- Support SDIO 3.0 protocol  
- Support SD3.0 card

• **SPI**

- Up to four SPI controllers,  
- Full-duplex synchronous serial interface

• **UART**

- Support up to 10 UARTs  
- UART2 with 2 wires for debug  
- Embedded two 64byte FIFO

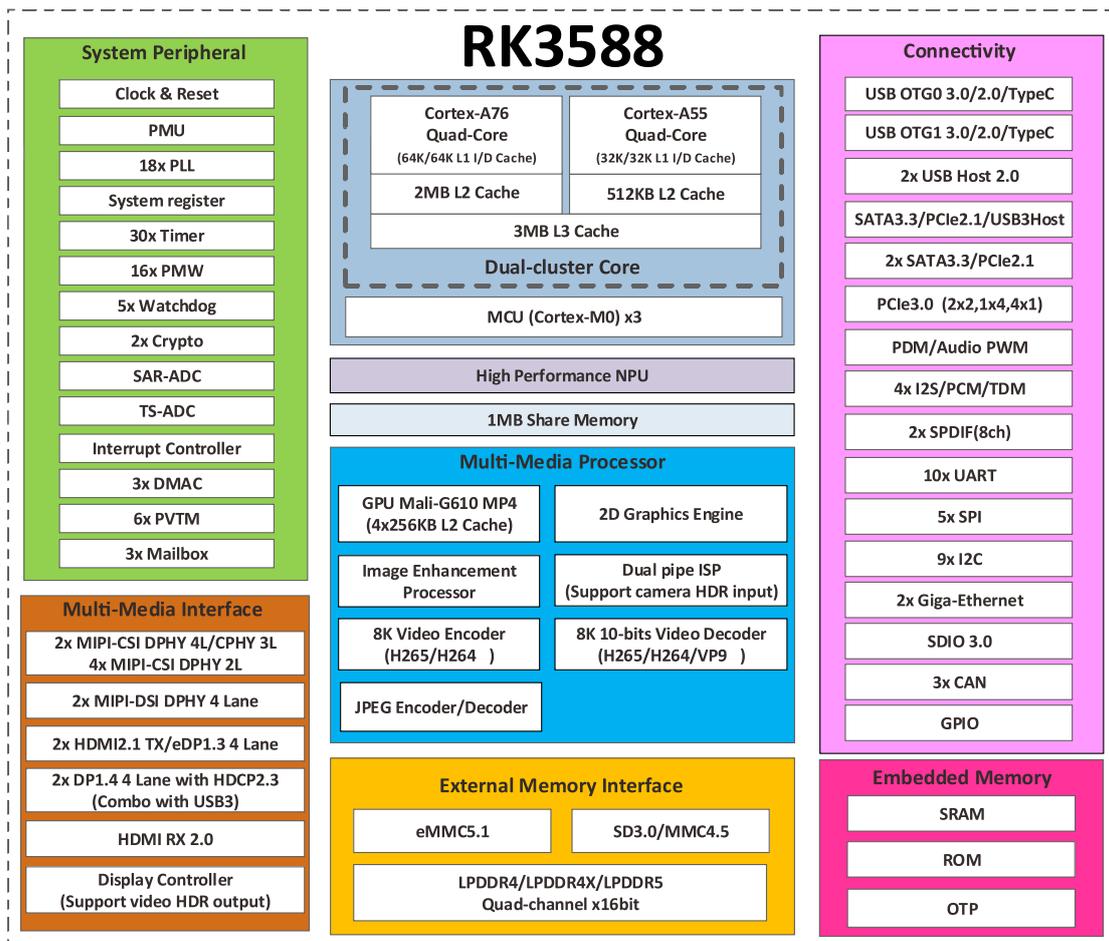
• **CAN**

- Support up to three CAN controller  
- Support CAN 2.0B protocol

- **ADC**
  - Up to Two ADC channels
  - 12-bit resolution up to 1MS/s sampling rate
  - Voltage input range between 0V to 1.8V
- **PWM**
  - Up to 15 PWMs with interrupt-based operation
  - Support 32bit time/counter facility
  - IR option on PWM3/7/11/15
- **Power unit**
  - PMU RK806 on board
  - 3.4 ~ 5.5V Power input up to 4A current
  - 1.8V and 3.3V max 500mA output
  - Very low RTC consume current, less 5uA at 3V button Cell.

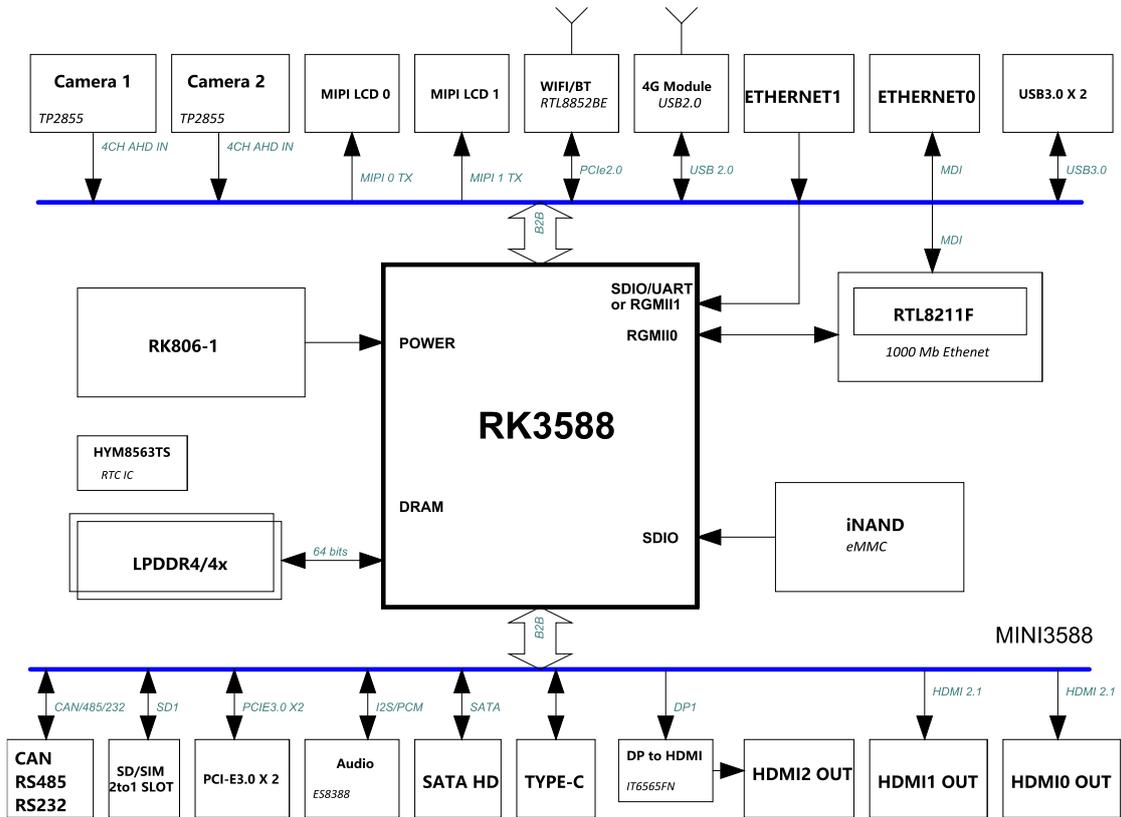
## 1.3 Mini3588 Block Diagram

### 1.3.1 RK3588 Block Diagram





### 1.3.2 Development board (EM3588) Block Diagram



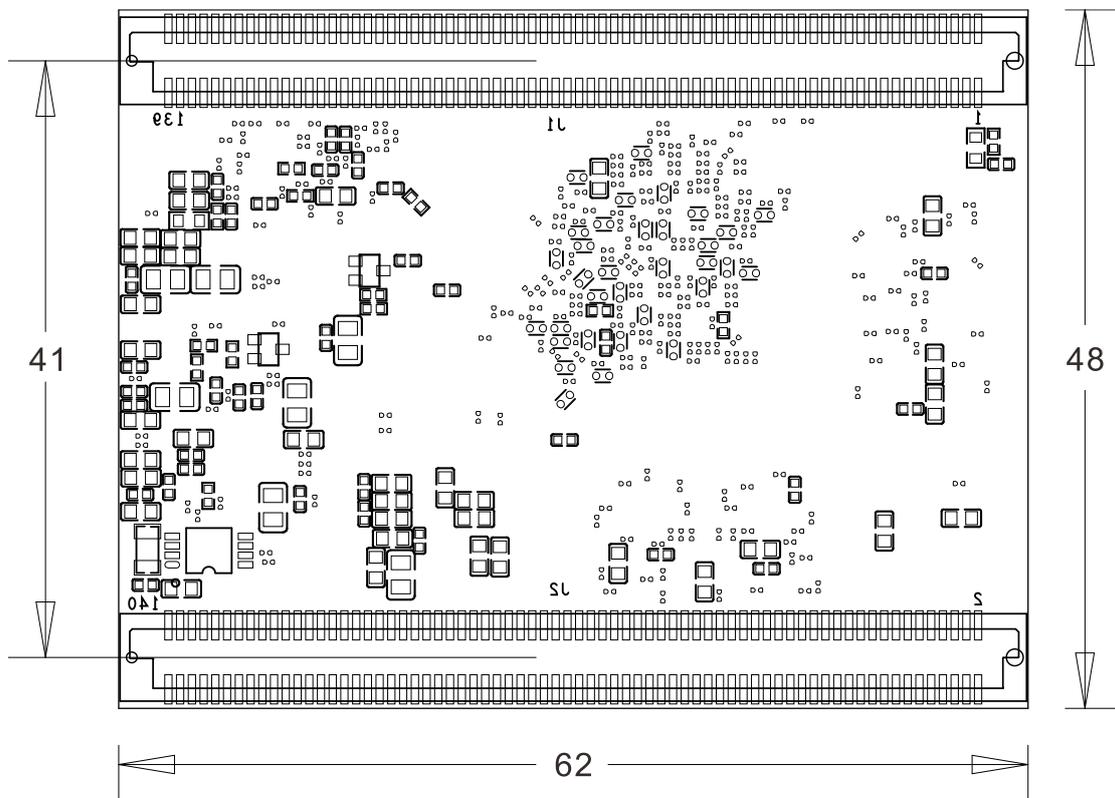
## 1.4 Mini3588 Specifications

| Feature      | Specifications   |
|--------------|--|
| CPU          | Quad-core Cortex-A72 and quad-core Cortex-A55                  |
| DDR          | 8GB LPDDR4X (up to 16GB)                                       |
| eMMC FLASH   | 32GB (up to 256GB)   |
| Power        | DC 3.4 ~ 5.5V  |
| EDP/MIPI DSI | 2-CH EDP, 2-CH MIPI DSI  |
| I2S          | 3-CH   |
| MIPI CSI     | 2-CH 4-Lane + 2-CH 2-Lane or 6-CH 2-Lane CSI (up to 6 Cameras) |
| SATA         | 3-CH   |
| HDMI out     | 2-CH (EDP option)  |
| DP out       | 2-CH   |
| CAN          | 3-CH   |
| USB          | 1-CH USB Host2.0 + 1-CH Type C and 2-CH USB Host3.0            |
| Ethernet     | 1-ch 1 GB PHY + 1-ch RGMII/RMII                                |
| SDMMC        | 2-CH   |
| SPDIF TX     | 2-CH   |



|                 |                   |
|-----------------|-------------------|
| I2C             | 7-CH              |
| SPI             | 4-CH              |
| CAN             | 3-CH              |
| UART            | 9-CH, 1-CH(DEBUG) |
| PWM             | 15-CH             |
| ADC IN          | 2-CH              |
| Board Dimension | 62 x 48mm         |

## 1.5 Mini3588 PCB Dimension



## 1.6 Mini3588 Pin Definition

| J1 | Signal    | Description or functions   | GPIO serial | IO Voltage |
|----|-----------|--|-------------|------------|
| 1  | SDMMC0_D1 | PWM9_M1/I2C3_SDA_M4/P<br>DM1_SDI2_M0/JTAG_TMS_<br>M1/UART2_RX_M1 | GPIO4_D1_u  | 3.3V       |
| 2  | GND       | Ground   |             | 0V         |
| 3  | SDMMC0_D0 | PWM8_M1/I2C3_SCL_M4/P<br>DM1_SDI3_M0/JTAG_TCK_<br>M1/UART2_TX_M1 | GPIO4_D0_u  | 3.3V       |



| J1 | Signal              | Description or functions   | GPIO serial | IO Voltage |
|----|---------------------|--|-------------|------------|
| 4  | eDP1_TX_AUXN        | HDMI_TX1_SBDN<br>/EDP_TX1_AUXN                                     |             | 0.5V       |
| 5  | SDMMC0_CLK          | TEST_CLKOUT_M0/CAN0_RX_M1/PDM1_CLK0_M0/MCU_JTAG_TMS_M0/UART5_TX_M0 | GPIO4_D5_d  | 3.3V       |
| 6  | eDP1_TX_AUXP        | HDMI_TX1_SBDP<br>/EDP_TX1_AUXP                                     |             | 0.5V       |
| 7  | SDMMC0_CMD          | PWM7_IR_M1/CAN0_TX_M1/PDM1_CLK1_M0/MCU_JTAG_TCK_M0/UART5_RX_M0     | GPIO4_D4_u  | 3.3V       |
| 8  | eDP1_TX3N           | HDMI1_TX3N_PORT<br>/eDP1_TX_D3N                                    |             | 0.5V       |
| 9  | SDMMC0_D3           | PWM10_M1/I2C8_SDA_M0/PDM1_SDI0_M0/JTAG_TMS_M0/UART5_RTSN_M0        | GPIO4_D3_u  | 3.3V       |
| 10 | eDP1_TX3P           | HDMI1_TX3P_PORT<br>/eDP1_TX_D3P                                    |             | 0.5V       |
| 11 | SDMMC0_D2           | I2C8_SCL_M0/PDM1_SDI1_M0/JTAG_TCK_M0/UART5_CTSN_M0                 | GPIO4_D2_u  | 3.3V       |
| 12 | eDP1_TX0N           | HDMI1_TX0N_PORT/eDP1_TX_D0N  |             | 0.5V       |
| 13 | TYPEC1_USB20_OTG_DP |  |             | 1.8V       |
| 14 | eDP1_TX0P           | HDMI1_TX0P_PORT<br>/eDP1_TX_D0P                                    |             | 0.5V       |
| 15 | TYPEC1_USB20_OTG_DM |  |             | 1.8V       |
| 16 | eDP1_TX1N           | HDMI1_TX1N_PORT<br>/eDP1_TX_D1N                                    |             | 0.5V       |
| 17 | USB20_HOST1_DP      |  |             | 1.8V       |
| 18 | eDP1_TX1P           | HDMI1_TX1P_PORT<br>/eDP1_TX_D1P                                    |             | 0.5V       |
| 19 | USB20_HOST1_DM      |  |             | 1.8V       |
| 20 | eDP1_TX2N           | HDMI1_TX2N_PORT<br>/eDP1_TX_D2N                                    |             | 0.5V       |
| 21 | USB20_HOST0_DP      |  |             | 1.8V       |
| 22 | eDP1_TX2P           | HDMI1_TX2P_PORT<br>/eDP1_TX_D2P                                    |             | 0.5V       |
| 23 | USB20_HOST0_DM      |  |             | 1.8V       |
| 24 | GND                 | Ground   |             | 0V         |



| J1 | Signal              | Description or functions   | GPIO serial      | IO Voltage |
|----|---------------------|----------------------------|------------------|------------|
| 25 | GND                 | Ground                     |                  | 0V         |
| 26 | TYPEC0_SSRX1N       | TYPEC0_SSRX1N<br>/DP0_TX0N | (Default TYPE-C) | 0.5V       |
| 27 | DP1_TX3P            | TYPEC1_SSTX2P<br>/DP1_TX3P | (Default DP)     | 0.5V       |
| 28 | TYPEC0_SSRX1P       | TYPEC0_SSRX1P<br>/DP0_TX0P | (Default TYPE-C) | 0.5V       |
| 29 | DP1_TX3N            | TYPEC1_SSTX2N<br>/DP1_TX3N | (Default DP)     | 0.5V       |
| 30 | TYPEC0_SSTX1N       | TYPEC0_SSTX1N<br>/DP0_TX1N | (Default TYPE-C) | 0.5V       |
| 31 | DP1_TX2P            | TYPEC1_SSRX2P<br>/DP1_TX2P | (Default DP)     | 0.5V       |
| 32 | TYPEC0_SSTX1P       | TYPEC0_SSTX1P<br>/DP0_TX1P | (Default TYPE-C) | 0.5V       |
| 33 | DP1_TX2N            | TYPEC1_SSRX2N<br>/DP1_TX2N | (Default DP)     | 0.5V       |
| 34 | TYPEC0_SSRX2N       | TYPEC0_SSRX2N<br>/DP0_TX2N | (Default TYPE-C) | 0.5V       |
| 35 | DP1_TX1P            | TYPEC1_SSTX1P<br>/DP1_TX1P | (Default DP)     | 0.5V       |
| 36 | TYPEC0_SSRX2P       | TYPEC0_SSRX2P<br>/DP0_TX2P | (Default TYPE-C) | 0.5V       |
| 37 | DP1_TX1N            | TYPEC1_SSTX1N<br>/DP1_TX1N | (Default DP)     | 0.5V       |
| 38 | TYPEC0_SSTX2N       | TYPEC_SSTX2N<br>/DP0_TX3N  | (Default TYPE-C) | 0.5V       |
| 39 | DP1_TX0P            | TYPEC1_SSRX1P<br>/DP1_TX0P | (Default DP)     | 0.5V       |
| 40 | TYPEC0_SSTX2P       | TYPEC_SSTX2P<br>/DP0_TX3P  | (Default TYPE-C) | 0.5V       |
| 41 | DP1_TX0N            | TYPEC1_SSRX1N<br>/DP1_TX0N | (Default DP)     | 0.5V       |
| 42 | GND                 | Ground                     |                  | 0V         |
| 43 | DP1_AUXP            | TYPEC1_SBU1/DP1_AUXP       | (Default DP)     | 0.5V       |
| 44 | MIPI_DPHY1_TX_D0N   |                            |                  | 0.5V       |
| 45 | DP1_AUXN            | TYPEC1_SBU2/DP1_AUXN       | (Default DP)     | 0.5V       |
| 46 | MIPI_DPHY1_TX_D0P   |                            |                  | 0.5V       |
| 47 | TYPEC0_USB20_OTG_DM | USB download Port          |                  | 1.8V       |
| 48 | MIPI_DPHY1_TX_D1N   |                            |                  | 0.5V       |
| 49 | TYPEC0_USB20_OTG    | USB download Port          |                  | 1.8V       |



| J1 | Signal               | Description or functions  | GPIO serial      | IO Voltage |
|----|----------------------|---------------------------|------------------|------------|
|    | _DP                  |                           |                  |            |
| 50 | MIPI_DPHY1_TX_D1P    |                           |                  | 0.5V       |
| 51 | TYPEC0_USB20_OTG_ID  | USB20 OTG ID input        |                  | 1.8V       |
| 52 | MIPI_DPHY1_TX_D2N    |                           |                  | 0.5V       |
| 53 | TYPEC0_USB20_VBUSDET | USB OTG VBUS detect input |                  | 3.3V       |
| 54 | MIPI_DPHY1_TX_D2P    |                           |                  | 0.5V       |
| 55 | TYPEC0_SBU1/DP0_AUXP | TYPEC0_SBU1/DP0_AUXP      | (Default TYPE-C) | 0.5V       |
| 56 | MIPI_DPHY1_TX_CLK_N  |                           |                  | 0.5V       |
| 57 | TYPEC0_SBU2/DP0_AUXN | TYPEC0_SBU2/DP0_AUXN      | (Default TYPE-C) | 0.5V       |
| 58 | MIPI_DPHY1_TX_CLK_P  |                           |                  | 0.5V       |
| 59 | MIPI_DPHY1_RX_D0N    |                           |                  | 0.5V       |
| 60 | MIPI_DPHY1_TX_D3N    |                           |                  | 0.5V       |
| 61 | MIPI_DPHY1_RX_D0P    |                           |                  | 0.5V       |
| 62 | MIPI_DPHY1_TX_D3P    |                           |                  | 0.5V       |
| 63 | MIPI_DPHY1_RX_D1N    |                           |                  | 0.5V       |
| 64 | MIPI_DPHY0_TX_D0P    |                           |                  | 0.5V       |
| 65 | MIPI_DPHY1_RX_D1P    |                           |                  | 0.5V       |
| 66 | MIPI_DPHY0_TX_D0N    |                           |                  | 0.5V       |
| 67 | GND                  | Ground                    |                  | 0V         |
| 68 | MIPI_DPHY0_TX_D1P    |                           |                  | 0.5V       |
| 69 | MIPI_DPHY1_RX_CLK_N  |                           |                  | 0.5V       |
| 70 | MIPI_DPHY0_TX_D1N    |                           |                  | 0.5V       |
| 71 | MIPI_DPHY1_RX_CLK_P  |                           |                  | 0.5V       |
| 72 | MIPI_DPHY0_TX_CLK_P  |                           |                  | 0.5V       |
| 73 | MIPI_DPHY0_RX_D0P    |                           |                  | 0.5V       |
| 74 | MIPI_DPHY0_TX_CLK_N  |                           |                  | 0.5V       |
| 75 | MIPI_DPHY0_RX_D0N    |                           |                  | 0.5V       |
| 76 | MIPI_DPHY0_TX_D2P    |                           |                  | 0.5V       |
| 77 | MIPI_DPHY0_RX_D1P    |                           |                  | 0.5V       |
| 78 | MIPI_DPHY0_TX_D2N    |                           |                  | 0.5V       |
| 79 | MIPI_DPHY0_RX_D1N    |                           |                  | 0.5V       |



| J1  | Signal             | Description or functions | GPIO serial | IO Voltage |
|-----|--------------------|--------------------------|-------------|------------|
| 80  | MIPI_DPHY0_TX_D3P  |                          |             | 0.5V       |
| 81  | MIPI_DPHY0_RX_CLKP |                          |             | 0.5V       |
| 82  | MIPI_DPHY0_TX_D3N  |                          |             | 0.5V       |
| 83  | MIPI_DPHY0_RX_CLKN |                          |             | 0.5V       |
| 84  | GND                | Ground                   |             | 0V         |
| 85  | GND                | Ground                   |             | 0V         |
| 86  | MIPI_CS11_RX_CLK1P |                          |             | 0.5V       |
| 87  | MIPI_CS11_RX_CLK0P |                          |             | 0.5V       |
| 88  | MIPI_CS11_RX_CLK1N |                          |             | 0.5V       |
| 89  | MIPI_CS11_RX_CLK0N |                          |             | 0.5V       |
| 90  | MIPI_CS11_RX_D3P   |                          |             | 0.5V       |
| 91  | MIPI_CS11_RX_D1P   |                          |             | 0.5V       |
| 92  | MIPI_CS11_RX_D3N   |                          |             | 0.5V       |
| 93  | MIPI_CS11_RX_D1N   |                          |             | 0.5V       |
| 94  | MIPI_CS11_RX_D2P   |                          |             | 0.5V       |
| 95  | MIPI_CS11_RX_D0P   |                          |             | 0.5V       |
| 96  | MIPI_CS11_RX_D2N   |                          |             | 0.5V       |
| 97  | MIPI_CS11_RX_D0N   |                          |             | 0.5V       |
| 98  | MIPI_CS10_RX_CLK1P |                          |             | 0.5V       |
| 99  | GND                | Ground                   |             | 0V         |
| 100 | MIPI_CS10_RX_CLK1N |                          |             | 0.5V       |
| 101 | PHY_MDI3-          |                          |             | 0.5V       |
| 102 | MIPI_CS10_RX_D3P   |                          |             | 0.5V       |
| 103 | PHY_MDI3+          |                          |             | 0.5V       |
| 104 | MIPI_CS10_RX_D3N   |                          |             | 0.5V       |
| 105 | PHY_MDI2-          |                          |             | 0.5V       |
| 106 | MIPI_CS10_RX_D2P   |                          |             | 0.5V       |
| 107 | PHY_MDI2+          |                          |             | 0.5V       |
| 108 | MIPI_CS10_RX_D2N   |                          |             | 0.5V       |
| 109 | PHY_MDI1-          |                          |             | 0.5V       |
| 110 | MIPI_CS10_RX_CLK0P |                          |             | 0.5V       |
| 111 | PHY_MDI1+          |                          |             | 0.5V       |
| 112 | MIPI_CS10_RX_CLK0N |                          |             | 0.5V       |
| 113 | PHY_MDI0-          |                          |             | 0.5V       |
| 114 | MIPI_CS10_RX_D1P   |                          |             | 0.5V       |
| 115 | PHY_MDI0+          |                          |             | 0.5V       |
| 116 | MIPI_CS10_RX_D1N   |                          |             | 0.5V       |
| 117 | PHY_LED1/CFG_Ldo0  | Ethernet Speed LED_L     | (PD 10K)    | 3.3V       |
| 118 | MIPI_CS10_RX_D0P   |                          |             | 0.5V       |
| 119 | PHY_LED2/CFG_Ldo1  | Ethernet Speed LED_H     | (PU 10K)    | 3.3V       |



| J1  | Signal           | Description or functions   | GPIO serial | IO Voltage |
|-----|------------------|--|-------------|------------|
| 120 | MIPI_CSI0_RX_D0N |  |             | 0.5V       |
| 121 | GND              | Ground   |             | 0V         |
| 122 | GND              | Ground   |             | 0V         |
| 123 | GMAC1_TXCLK      | AUDDSM_RP/SPI4_CS1_M1/UART8_RTSN_M1/I2S3_SDI/SDIO_CMD_M1                       | GPIO3_A4_d  | 3.3V       |
| 124 | GMAC1_RXDV_CRS   | PWM2_M1/MIPI_CAMERA4_CLK_M1/UART2_TX_M2/GMAC1_RXDV_CRS                         | GPIO3_B1_d  | 3.3V       |
| 125 | GMAC1_TXEN       | PWM12_M0/CAN1_RX_M0/UART3_TX_M1/I2S2_SCLK_M1/GMAC1_TXEN                        | GPIO3_B5_u  | 3.3V       |
| 126 | GMAC1_RXCLK      | MIPI_CAMERA0_CLK_M1/UART8_CTSN_M1/I2C4_SDA_M0/FSPI_CLK_M2/SDIO_CLK_M1          | GPIO3_A5_d  | 3.3V       |
| 127 | GMAC1_TXD0       | UART2_RTSN/I2S2_SDO_M1   | GPIO3_B3_u  | 3.3V       |
| 128 | GMAC1_RXD0       | PWM8_M0/MIPI_CAMERA2_CLK_M1  | GPIO3_A7_u  | 3.3V       |
| 129 | GMAC1_TXD1       | UART2_CTSN/I2S2_MCLK_M1/GMAC1_TXD1   | GPIO3_B4_u  | 3.3V       |
| 130 | GMAC1_RXD1       | PWM9_M0/MIPI_CAMERA3_CLK_M1  | GPIO3_B0_u  | 3.3V       |
| 131 | GMAC1_TXD2       | PWM10_M0/SPI4_MISO_M1/I2C6_SDA_M4/FSPI_D0_M2/I2S3_MCLK/SDIO_D0_M1              | GPIO3_A0_u  | 3.3V       |
| 132 | GMAC1_RXD2       | AUDDSM_LP/SPI4_CLK_M1/UART8_TX_M1/FSPI_D2_M2/I2S3_LRCK/SDIO_D2_M1              | GPIO3_A2_u  | 3.3V       |
| 133 | GMAC1_TXD3       | AUDDSM_LN/SPI4_MOSI_M1/PWM11_IR_M0/I2C6_SCL_M4/FSPI_D1_M2/I2S3_SCLK/SDIO_D1_M1 | GPIO3_A1_u  | 3.3V       |
| 134 | GMAC1_RXD3       | AUDDSM_RN/SPI4_CS0_M1/UART8_RX_M1/FSPI_D3_M2/I2S3_SDO/SDIO_D3_M1               | GPIO3_A3_u  | 3.3V       |
| 135 | GMAC1_MDIO       | PWM15_IR_M0/UART7_CTSN_M1/I2C8_SDA_M4/SPI1_CS1_M1/MIPI_TE1                     | GPIO3_C3_d  | 3.3V       |
| 136 | GMAC1_MCLKINOUT  | PWM13_M0/CAN1_TX_M0/UART3_RX_M1/I2S2_LRCK_M1/GMAC1_MCLKINOUT                   | GPIO3_B6_d  | 3.3V       |



| J1  | Signal       | Description or functions   | GPIO serial           | IO Voltage |
|---|--------------|--|-----------------------|------------|
| 137   | GMAC1_MDC    | PWM14_M0/UART7_RTSN_M1/I2C8_SCL_M4/SPI1_CS0_M1/MIPI_TE0                                  | GPIO3_C2_d            | 3.3V       |
| 138   | UART3_RX_M2  | SPI2_CLK_M1/I2C5_SCL_M2/I2S1_SPDI_M0/PCIE30X2_CLKREQN_M1/BT1120_D6                       | CIF_D6<br>/GPIO4_A6_d | 3.3V       |
| 139   | GMAC1_RSTn_L | PWM4_M0/UART0_TX_M0/DP1_HPDIN_M1/I2S1_SDI0_M1/PCIE30X1_0_PERSTN_M0/I2C4_SCL_M2/GPU_AVS   | GPIO0_C5_u            | 3.3V       |
| 140   | UART3_TX_M2  | SPI2_MOSI_M1/UART3_TX_M2/I2C3_SDA_M2/I2S1_SDI0_M0/PCIE30X1_0_PERS TN_M1/BT1120_D5/CIF_D5 | GPIO4_A5_d            | 3.3V       |
| <p><b>Note:</b><br/> <i>Could be add DC common resistor for level shift circuit when HDMI1 used.<br/>           When DP1 exchange to TYPE C or USB3.0 need change some parts. Connect to me please.</i></p> |              |  |                       |            |

| J2 | Signal                | Description or functions                                 | GPIO serial | IO Voltage |
|----|-----------------------|--|-------------|------------|
| 1  | GND                   | Ground   |             | 0V         |
| 2  | HDMI0_TX2P            | HDMI0_TX2P_PORT<br>/eDP0_TX_D2P                          |             | 0.5V       |
| 3  | HDMI0_TX1P            | HDMI0_TX1P_PORT<br>/eDP0_TX_D1P                          |             | 0.5V       |
| 4  | HDMI0_TX2N            | HDMI0_TX2N_PORT<br>/eDP0_TX_D2N                          |             | 0.5V       |
| 5  | HDMI0_TX1N            | HDMI0_TX1N_PORT<br>/eDP0_TX_D1N                          |             | 0.5V       |
| 6  | HDMI0_CLKP            | HDMI0_TX3P_PORT<br>/eDP0_TX_D3P                          |             | 0.5V       |
| 7  | HDMI0_TX0P            | HDMI0_TX0P_PORT<br>/eDP0_TX_D0P                          |             | 0.5V       |
| 8  | HDMI0_CLKN            | HDMI0_TX3N_PORT<br>/eDP0_TX_D3N                          |             | 0.5V       |
| 9  | HDMI0_TX0N            | HDMI0_TX0N_PORT/eDP0_TX_D0N                              |             | 0.5V       |
| 10 | GND                   | Ground   |             | 0V         |
| 11 | PCIE30X1_1_WAKEn_M1_L | SPI0_MOSI_M1/UART9_CTSN_M1/I2S1_SCLK_M0/BT1120_D1/CIF_D1 | GPIO4_A1_d  | 3.3V       |



| J2 | Signal                       | Description or functions   | GPIO serial | IO Voltage |
|----|------------------------------|--|-------------|------------|
| 12 | HDMITX0_CEC_M0               | SPDIF1_TX_M2/PWM6_M1/<br>SPI3_CS1_M1/I2C8_SDA_M<br>3/PCIE20X1_2_PERSTN_M<br>1/BT1120_D15   | GPIO4_C1_d  | 3.3V       |
| 13 | PCIE30X1_1_PERSTn<br>_M1_L   | SPI0_CLK_M1/I2S1_LRCK_<br>M0/BT1120_D2/CIF_D2  | GPIO4_A2_d  | 3.3V       |
| 14 | HDMITX0_SDA_M0               | SPI3_CS0_M1/I2C8_SCL_M<br>3/HDMI_TX0_SDA_M0/PCIE<br>20X1_2_WAKEN_M1/BT112<br>0_D14   | GPIO4_C0_u  | 3.3V       |
| 15 | PCIE30x1_1_CLKREQ<br>n_M1_L  | SPI0_MISO_M1/UART9_RT<br>Sn_M1/I2S1_MCLK_M0/BT1<br>120_D0/CIF_D0   | GPIO4_A0_d  | 3.3V       |
| 16 | HDMITX0_SCL_M0               | SPI3_CLK_M1/I2C5_SDA_M<br>1/PCIE20X1_2_CLKREQN_<br>M1/BT1120_D13   | GPIO4_B7_u  | 3.3V       |
| 17 | SPDIF0_TX_M1                 | PWM11_IR_M1/DPO_HPDIN<br>_M0/UART9_TX_M1/I2S1_S<br>DO3_M0/PCIE30X4_CLKRE<br>QN_M1/BT1120_D10/CIF_C<br>LKOUT                      | GPIO4_B4_u  | 3.3V       |
| 18 | SPDIF1_TX_M1                 | SATA2_ACT_LED_M0/SPI0_<br>CS1_M1/UART8_RX_M0/I2<br>C6_SCL_M3/I2S1_SDO0_M<br>0/PCIE30X1_0_BUTTON_R<br>STN/MIPI_CAMERA0_CLK_<br>M0 | GPIO4_B1_u  | 3.3V       |
| 19 | SATA0_ACT_LED_M0             | PWM13_M1/SPI3_MOSI_M1<br>/I2C5_SCL_M1/HDMI_RX_H<br>PDOOUT_M0/PCIE30X4_PER<br>STN_M1/BT1120_D12                                   | GPIO4_B6_d  | 3.3V       |
| 20 | SATA1_ACT_LED_M0             | PWM12_M1/SPI3_MISO_M1<br>/UART9_RX_M1/HDMI_RX_<br>CEC_M0/PCIE30X4_WAKE<br>N_M1/BT1120_D11  | GPIO4_B5_d  | 3.3V       |
| 21 | USB_OTG_PWREN_H<br>_GPIO4_A7 | SPI2_CS0_M1/I2C5_SDA_M<br>2/I2S1_SDI2_M0/PCIE30X2_<br>WAKEN_M1/BT1120_D7/CIF<br>_D7  | GPIO4_A7_d  | 3.3V       |
| 22 | PWM9_M2                      | PWM9_M2/PCIE20X1_2_PE<br>RSTN_M0/UART4_TX_M1/S<br>PI0_MISO_M3/HDMI_RX_C<br>EC_M1/CIF_D13   | GPIO3_D1_d  | 3.3V       |



| J2 | Signal               | Description or functions  | GPIO serial             | IO Voltage |
|----|----------------------|---|-------------------------|------------|
| 23 | GPIO4_B0_d           | SPI2_CS1_M1/UART8_TX_M0/I2C6_SDA_M3/I2S1_SDI3_M0/PCIE30X2_PERSTN_M1/BT1120_CLKOUT/CIF_CLKIN             | GPIO4_B0_d              | 3.3V       |
| 24 | GPIO3_A6_d           | MIPI_CAMERA1_CLK_M1/I2C4_SCL_M0/ETH1_REFCLK_OCK_25M   | GPIO3_A6_d              | 3.3V       |
| 25 | RECOVERY_SARADC_VIN1 | Program need short to GND when power on.  | ( PU 10K)               | 1.8V       |
| 26 | UART0_RX_M2          | SPI2_MISO_M1/I2C3_SCL_M2/PCIE30X1_0_WAKEN_M1/BT1120_D4/CIF_D4   | GPIO4_A4_d              | 3.3V       |
| 27 | SARADC_VIN5          |   |                         | 1.8V       |
| 28 | UART0_TX_M2          | PCIE30X1_0_CLKREQN_M1/BT1120_D3/CIF_D3  | GPIO4_A3_d              | 3.3V       |
| 29 | GND                  | Ground  |                         | 0V         |
| 30 | I2C5_SCL_M0          | PCIE20X1_2_CLKREQN_M0/SPI3_MOSI_M3/HDMI_TX0_SCL_M2/CIF_D11  | GPIO3_C7_u              | 3.3V       |
| 31 | PWM15_IR_M1          | CAN1_TX_M1/UART8_CTS_N_M0/I2C7_SDA_M3/I2S1_SDO2_M0/PCIE20X1_2_BUTTON_RSTN/BT1120_D9/CIF_VSYNC           | GPIO4_B3_u              | 3.3V       |
| 32 | I2C5_SDA_M0          | PWM8_M2/PCIE20X1_2_WAKEN_M0/UART4_RX_M1/SPI3_CLK_M3/HDMI_TX0_SDA_M2/CIF_D12                             | GPIO3_D0_u              | 3.3V       |
| 33 | GPIO4_B2_U           | CAN1_RX_M1/SPI0_CS0_M1/UART8_RTSN_M0/I2C7_SCL_M3/I2S1_SDI0_M0/PCIE30X1_1_BUTTON_RSTN/BT1120_D8/CIF_HREF | GPIO4_B2_u<br>/PWM14_M1 | 3.3V       |
| 34 | GND                  | Ground  |                         | 0V         |
| 35 | PCIE30X4_WAKEn_M2_L  | CAN2_TX_M0/UART5_RX_M1/FSPI_CS1N_M2/SPI3_CS1_M3/HDMI_TX1_SDA_M1/CIF_D9                                  | GPIO3_C5_u              | 3.3V       |
| 36 | PCIE30X2_PERSTn_M2   | UART9_RX_M2/SPI0_CS0_M3/HDMI_RX_HPDPDOUT_M1/HDMI_TX0_HPDPD_M1/MCU_JTAG_TCK_M1                           | GPIO3_D4_d              | 3.3V       |



| J2 | Signal                | Description or functions   | GPIO serial | IO Voltage |
|----|-----------------------|--|-------------|------------|
| 37 | PCIE30X4_CLKREQn_M2_L | CAN2_RX_M0/PCIE30X4_CLKREQN_M2/UART5_TX_M1/FSPi_CS0N_M2/SPI3_CS0_M3/HDMI_TX1_CEC_M2/CIF_D8 | GPIO3_C4_u  | 3.3V       |
| 38 | PCIE30x2_CLKREQn_M2   | UART9_RTSN_M2/I2C7_SCL_M2/SPI0_MOSI_M3/HDMI_RX_SCL_M1/CIF_D14                              | GPIO3_D2_d  | 3.3V       |
| 39 | PCIE30X4_PERSTn_M2_L  | PCIE30X4_PERSTN_M2/SPI3_MISO_M3/HDMI_TX1_SCL_M1/CIF_D10                                    | GPIO3_C6_u  | 3.3V       |
| 40 | PCIE30X2_WAKEn_M2     | PWM10_M2/UART9_CTSN_M2/I2C7_SDA_M2/SPI0_CLK_M3/HDMI_RX_SDA_M1/CIF_D15                      | GPIO3_D3_d  | 3.3V       |
| 41 | UART7_RX_M1           | PCIE30X2_BUTTON_RSTN/SPI1_CLK_M1/GMAC1_PPS_CLK   | GPIO3_C1_d  | 3.3V       |
| 42 | GPIO3_B2_d            | PWM3_IR_M1/UART2_RX_M2/I2S2_SDI_M1/GMAC1_TXER  | GPIO3_B2_d  | 3.3V       |
| 43 | UART7_TX_M1           | I2C3_SDA_M1/SPI1_MISO_M1/GMAC1_PPSTRIG   | GPIO3_C0_d  | 3.3V       |
| 44 | SATA_CP_POD           | PWM5_M1/UART0_RTSN/I2S1_SDI1_M1/PCIE30X4_CLKREQN_M0/SPI0_CLK_M0/NPU_AVS                    | GPIO0_C6_u  | 3.3V       |
| 45 | CAN0_TX_M0            | I2S1_LRCK_M1/PCIE30X1_1_PERSTN_M0/SPI0_CS1_M0/I2C2_SCL_M0/PWM0_M0                          | GPIO0_B7_d  | 3.3V       |
| 46 | GPIO3_B7_d            | I2C3_SCL_M1/SPI1_MOSI_M1/HDMI_TX1_HPD_M1/GMAC1_PTP_REF_CLK                                 | GPIO3_B7_d  | 3.3V       |
| 47 | CAN0_RX_M0            | PDM0_CLK0_M1/PCIE30X1_0_CLKREQN_M0/SPI0_MOSI_M0/I2C2_SDA_M0/PWM1_M0                        | GPIO0_C0_d  | 3.3V       |
| 48 | PWM2_M0               | UART0_RX_M0/DP0_HPDIN_M1/PDM0_CLK1_M1/PCIE30X1_0_WAKEN_M0/I2C4_SDA_M2                      | GPIO0_C4_d  | 3.3V       |
| 49 | GND                   | Ground   |             | 0V         |



| J2 | Signal                   | Description or functions   | GPIO serial                  | IO Voltage |
|----|--------------------------|--|------------------------------|------------|
| 50 | UART2_RX_M0_DEB<br>UG    | I2S1_SCLK_M1/PCIE30X1_1_WAKEN_M0/I2C1_SDA_M0/JTAG_TMS_M2   | GPIO0_B6_d<br>(Debug UART)   | 3.3V       |
| 51 | MIPI_CAM3_CLKO_M0_1V8    | HDMI_RX_SCL_M2/I2C8_SCL_M2/UART1_RTSN_M1   | GPIO1_D6_u<br>/PWM14_M2      | 1.8V       |
| 52 | UART2_TX_M0_DEB<br>UG    | I2S1_MCLK_M1/PCIE30X1_1_CLKREQN_M0/I2C1_SCL_M0/JTAG_TCK_M2                                       | GPIO0_B5_d<br>(Debug UART)   | 3.3V       |
| 53 | MIPI_CAM4_CLKO_M0_1V8    | HDMI_RX_SDA_M2/PCIE30X2_CLKREQN_M3/I2C8_SDA_M2/UART1_CTSN_M1                                     | GPIO1_D7_u<br>/PWM15_IR_M3   | 1.8V       |
| 54 | I2C6_SDA_M0              | UART1_RTSN_M2/PDM0_SDI0_M1/I2S1_SDI2_M1/PCIE30X4_WAKEN_M0/SPI0_MISO_M0/PWM6_M0                   | GPIO0_C7_d<br>(PU2.2K)       | 3.3V       |
| 55 | MIPI_CAM2_CLKO_M0_1V8    | SATA2_ACT_LED_M1/HDMI_RX_CEC_M2/PWM13_M2/SPDIF1_TX_M0/PCIE30X2_PERSTN_M3/I2C5_SDA_M3/UART1_RX_M1 | GPIO1_B7_u                   | 1.8V       |
| 56 | I2C6_SCL_M0              | UART1_CTSN_M2/PDM0_SDI1_M1/I2S1_SDI3_M1/PCIE30X4_PERSTN_M0/SPI3_MISO_M2/I2C6_SCL_M0/PWM7_IR_M0   | GPIO0_D0_d<br>(PU2.2K)       | 3.3V       |
| 57 | PDM1_CLK0_M1_1V8         | SPI0_CS0_M2/PCIE30X1_0_PERSTN_M2/UART7_RX_M2   | GPIO1_B4_u                   | 1.8V       |
| 58 | DP1_HPDI<br>N_M0         | PWM11_IR_M3/PCIE30X4_BUTTON_RSTN/UART9_TX_M2/SPI0_CS1_M3/DP1_HPDI<br>N_M0/MCU_JTAG_TMS_M1        | GPIO3_D5_d                   | 3.3V       |
| 59 | PDM1_SDI0_M1_1V8         | PWM3_IR_M3/SPI2_CS0_M0/PCIE30X1_1_PERSTN_M2  | GPIO1_A7_u                   | 1.8V       |
| 60 | SDMMC_DET_1V8            | SD Card Detection  | (Need pull up)<br>GPIO0_A4_u | 1.8V       |
| 61 | PDM1_SDI1_M1_1V8         | SPI2_CS1_M0/PCIE30X4_CLKREQN_M3/PDM1_SDI1_M1   | GPIO1_B0_u                   | 1.8V       |
| 62 | HDMITX1_HPDI<br>N_M0_1V8 | SPI2_CLK_M0  | GPIO1_A6_d                   | 1.8V       |



| J2 | Signal               | Description or functions   | GPIO serial            | IO Voltage |
|----|----------------------|--|------------------------|------------|
| 63 | PDM1_SDI2_M1_1V8     | SPI0_MISO_M2<br>/PCIE30X4_WAKE_M3  | GPIO1_B1_d             | 1.8V       |
| 64 | HDMITX0_HPDI0_M0_1V8 | SPI2_MOSI_M0   | GPIO1_A5_d             | 1.8V       |
| 65 | PDM1_SDI3_M1_1V8     | SPI0_MOSI_M2/UART4_RX_M2/PCIE30X4_PERST_M3                                   | GPIO1_B2_d             | 1.8V       |
| 66 | I2S0_SDI0_1V8        | I2S0_SDI0  | GPIO1_D4_d             | 1.8V       |
| 67 | PDM1_CLK1_M1_1V8     | UART4_TX_M2/SPI0_CLK_M2/PCIE30X1_0_WAKE_M2/SATA0_ACT_LED_M1                  | GPIO1_B3_d             | 1.8V       |
| 68 | I2S0_SDO2_SDI3_1V8   | UART6_RX_M2/I2C7_SDA_M0/SPI1_MOSI_M2/PDM0_SDI1_M0                            | GPIO1_D1_d             | 1.8V       |
| 69 | I2C2_SDA_M4_1V8      | UART6_RX_M1/PD0_HPDI0_M2/SPI4_MISO_M2/PCIE30X1_1_CLKREQN_M2                  | GPIO1_A0_d<br>(PU2.2K) | 1.8V       |
| 70 | I2S0_SDI1_1V8        | SPI1_CS0_M0/UART4_RX_M0/PWM1_M1/I2C1_SDA_M4/PDM0_SDI3_M0                     | GPIO1_D3_d             | 1.8V       |
| 71 | I2C2_SCL_M4_1V8      | SPI4_MOSI_M2/PCIE30X1_1_WAKEN_M2/DP1_HPDI0_M2/I2C2_SCL_M4/UART6_TX_M1        | GPIO1_A1_d<br>(PU2.2K) | 1.8V       |
| 72 | I2S0_SDO0_1V8        | UART4_CTSN<br>/I2C4_SCL_M4   | GPIO1_C7_d             | 1.8V       |
| 73 | I2C4_SDA_M3_1V8      | PWM0_M2/SPI4_CLK_M2/VOP_POST_EMPTY/UART6_RTSN_M1                             | GPIO1_A2_d<br>(PU2.2K) | 1.8V       |
| 74 | I2S0_SDO3_SDI2_1V8   | SPI1_CLK_M2/UART4_TX_M0/PWM0_M1/I2C1_SCL_M4/PDM0_SDI2_M0/I2S0_SDO3/I2S0_SDI2 | GPIO1_D2_d             | 1.8V       |
| 75 | I2C4_SCL_M3_1V8      | PWM1_M2/SPI4_CS0_M2/HDMI_TX1_SDA_M2/UART6_CTSN_M1                            | GPIO1_A3_d<br>(PU2.2K) | 1.8V       |
| 76 | I2S0_SDO1_1V8        | SPI1_MISO_M2/UART6_TX_M2/I2C7_SCL_M0   | GPIO1_D0_d             | 1.8V       |
| 77 | I2C3_SCL_M0_1V8      | UART3_TX_M0<br>/SPI4_MOSI_M0   | GPIO1_C1_z<br>(PU2.2K) | 1.8V       |
| 78 | I2S0_LRCK_RX_1V8     | PWM15_IR_M2/I2C4_SDA_M4/PDM0_CLK0_M0   | GPIO1_C6_d             | 1.8V       |
| 79 | I2C3_SDA_M0_1V8      | SPI4_MISO_M0<br>/UART3_RX_M0   | GPIO1_C0_z<br>(PU2.2K) | 1.8V       |



| J2  | Signal                        | Description or functions  | GPIO serial | IO Voltage |
|-----|-------------------------------|---|-------------|------------|
| 80  | I2S0_LRCK_TX_1V8              | UART4_RTSN<br>/I2C2_SCL_M3                                      | GPIO1_C5_d  | 1.8V       |
| 81  | GND                           | Ground  |             | 0V         |
| 82  | I2S0_MCLK_1V8                 | SPI4_CLK_M0/UART3_RTS<br>N/PWM3_IR_M2/I2C6_SDA_<br>M1           | GPIO1_C2_d  | 1.8V       |
| 83  | PCIE30_PORT1_REFC<br>LKN_IN   |   |             | 0.5V       |
| 84  | I2S0_SCLK_TX_1V8              | SPI4_CS0_M0/UART3_CTS<br>N/PWM7_IR_M2/I2C6_SCL_<br>M1/I2S0_SCLK | GPIO1_C3_d  | 1.8V       |
| 85  | PCIE30_PORT1_REFC<br>LKP_IN   |   |             | 0.5V       |
| 86  | I2S0_SCLK_RX_1V8              | SPI4_CS1_M0/PWM11_IR_<br>M2/I2C2_SDA_M3/PDM0_C<br>LK1_M0        | GPIO1_C4_d  | 1.8V       |
| 87  | PCIE30_PORT1_TX1N             |   |             | 0.5V       |
| 88  | GND                           | Ground  |             | 0V         |
| 89  | PCIE30_PORT1_TX1P             |   |             | 0.5V       |
| 90  | PCIE20_2_REFCLKN              |   |             | 0.5V       |
| 91  | PCIE30_PORT1_TX0N             |   |             | 0.5V       |
| 92  | PCIE20_2_REFCLKP              |   |             | 0.5V       |
| 93  | PCIE30_PORT1_TX0P             |   |             | 0.5V       |
| 94  | USB30_2_SSTXN                 | PCIE20_2_TXN/SATA30_2_<br>TXN/USB30_2_SSTXN                     |             | 0.5V       |
| 95  | PCIE30_PORT1_RX1N             |   |             | 0.5V       |
| 96  | USB30_2_SSTXP                 | PCIE20_2_TXP/SATA30_2_<br>TXP/USB30_2_SSTXP                     |             | 0.5V       |
| 97  | PCIE30_PORT1_RX1P             |   |             | 0.5V       |
| 98  | USB30_2_SSRXN                 | PCIE20_2_RXN/SATA30_2_<br>RXN/USB30_2_SSRXN                     |             | 0.5V       |
| 99  | PCIE30_PORT1_RX0N             |   |             | 0.5V       |
| 100 | USB30_2_SSRXP                 | PCIE20_2_RXP/SATA30_2_<br>RXP/USB30_2_SSRXP                     |             | 0.5V       |
| 101 | PCIE30_PORT1_RX0P             |   |             | 0.5V       |
| 102 | PCIE20_1_REFCLKN              |   |             | 0.5V       |
| 103 | GND                           | Ground  |             | 0V         |
| 104 | PCIE20_1_REFCLKP              |   |             | 0.5V       |
| 105 | PCIE30_PORT0_REFC<br>LKN_IN   |   |             | 0.5V       |
| 106 | PCIE20_1_RXN/SATA3<br>0_1_RXN | PCIE or SATA interface  |             | 0.5V       |

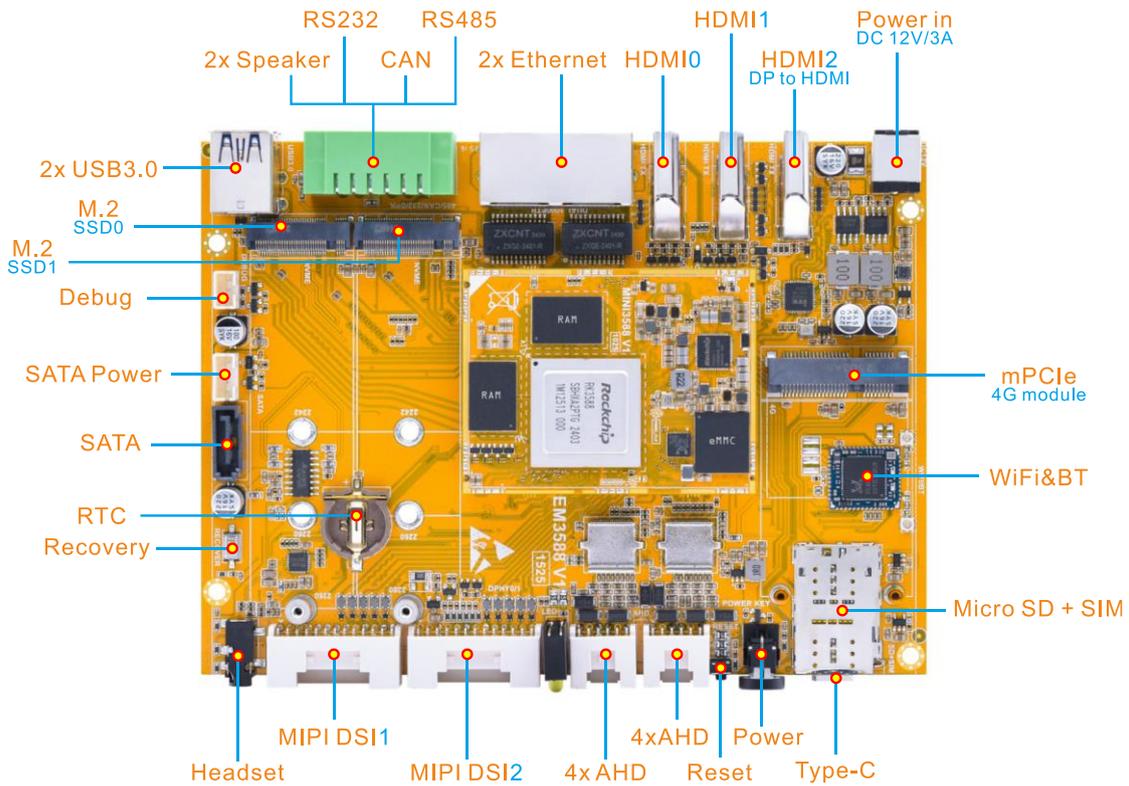


| J2  | Signal                        | Description or functions    | GPIO serial       | IO Voltage |
|-----|-------------------------------|-----------------------------|-------------------|------------|
| 107 | PCIE30_PORT0_REFC<br>LKP_IN   |                             |                   | 0.5V       |
| 108 | PCIE20_1_RXP<br>/SATA30_1_RXP | PCIE or SATA interface      |                   | 0.5V       |
| 109 | PCIE30_PORT0_TX1N             |                             |                   | 0.5V       |
| 110 | PCIE20_1_TXN/SATA3<br>0_1_TXN | PCIE or SATA interface      |                   | 0.5V       |
| 111 | PCIE30_PORT0_TX1P             |                             |                   | 0.5V       |
| 112 | PCIE20_1_TXP<br>/SATA30_1_TXP | PCIE or SATA interface      |                   | 0.5V       |
| 113 | PCIE30_PORT0_TX0N             |                             |                   | 0.5V       |
| 114 | PCIE20_0_REFCLKN              |                             |                   | 0.5V       |
| 115 | PCIE30_PORT0_TX0P             |                             |                   | 0.5V       |
| 116 | PCIE20_0_REFCLKP              |                             |                   | 0.5V       |
| 117 | PCIE30_PORT0_RX1N             |                             |                   | 0.5V       |
| 118 | PCIE20_0_TXN<br>/SATA30_0_TXN | PCIE or SATA interface      |                   | 0.5V       |
| 119 | PCIE30_PORT0_RX1P             |                             |                   | 0.5V       |
| 120 | PCIE20_0_TXP<br>/SATA30_0_TXP | PCIE or SATA interface      |                   | 0.5V       |
| 121 | PCIE30_PORT0_RX0N             |                             |                   | 0.5V       |
| 122 | PCIE20_0_RXN<br>/SATA30_0_RXN | PCIE or SATA interface      |                   | 0.5V       |
| 123 | PCIE30_PORT0_RX0P             |                             |                   | 0.5V       |
| 124 | PCIE20_0_RXP<br>/SATA30_0_RXP | PCIE or SATA interface      |                   | 0.5V       |
| 125 | GND                           | Ground                      |                   | 0V         |
| 126 | GND                           | Ground                      |                   | 0V         |
| 127 | RESET_L                       | System Reset (to RST_KEY)   |                   | 1.8V       |
| 128 | VCC_1V8                       | Output Max 500mA            |                   | 1.8V       |
| 129 | VCC_RTC                       | RTC button Cell power input |                   | 1.8~3.3V   |
| 130 | RTC32KOUT_WIFI                | 32.768kHz output            | (PU 10K)          | 1.8V       |
| 131 | VCC_3V3                       | Output Max 500mA            |                   | 3.3V       |
| 132 | PWR_EN                        | Power Key input             | (Pull UP VCC_SYS) | 3.3~4.5V   |
| 133 | GND                           | Ground                      |                   | 0V         |
| 134 | GND                           | Ground                      |                   | 0V         |
| 135 | VCC_SYS                       | System Power Input          |                   | 3.3~4.5V   |
| 136 | VCC_SYS                       | System Power Input          |                   | 3.3~4.5V   |
| 137 | VCC_SYS                       | System Power Input          |                   | 3.3~4.5V   |
| 138 | VCC_SYS                       | System Power Input          |                   | 3.3~4.5V   |
| 139 | VCC_SYS                       | System Power Input          |                   | 3.3~4.5V   |



| J2  | Signal  | Description or functions | GPIO serial | IO Voltage |
|-----|---------|--------------------------|-------------|------------|
| 140 | VCC_SYS | System Power Input       |             | 3.3~4.5V   |

## 1.7 Development Kit (EM3588)



## 1.8 Demo Box Case (EM3588)



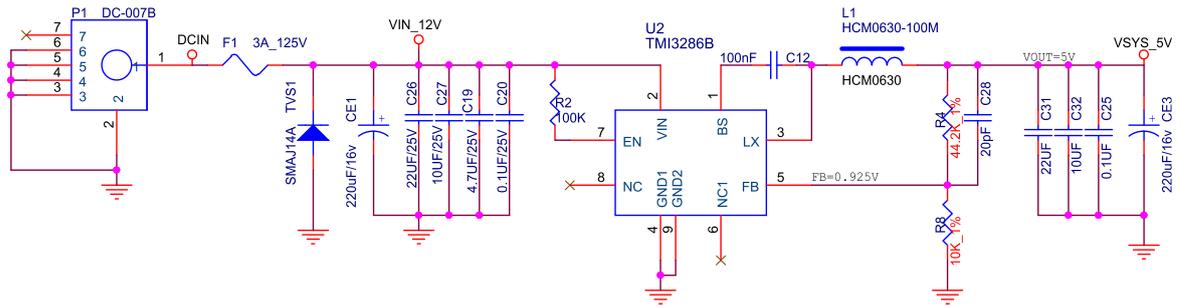


# 2 Hardware Design Guide

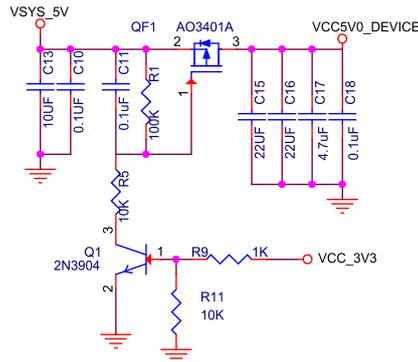
## 2.1 Peripheral Circuit Reference

### 2.1.1 External Power

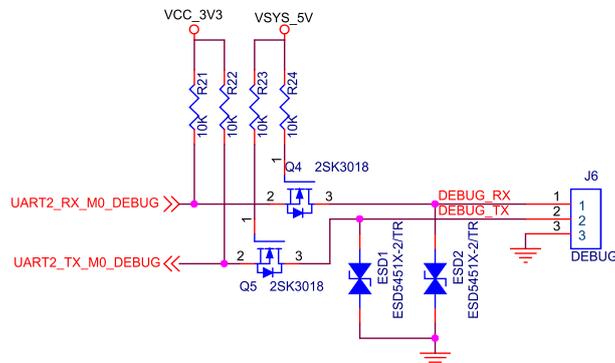
DC12V->DC5V



DEVICE 5V

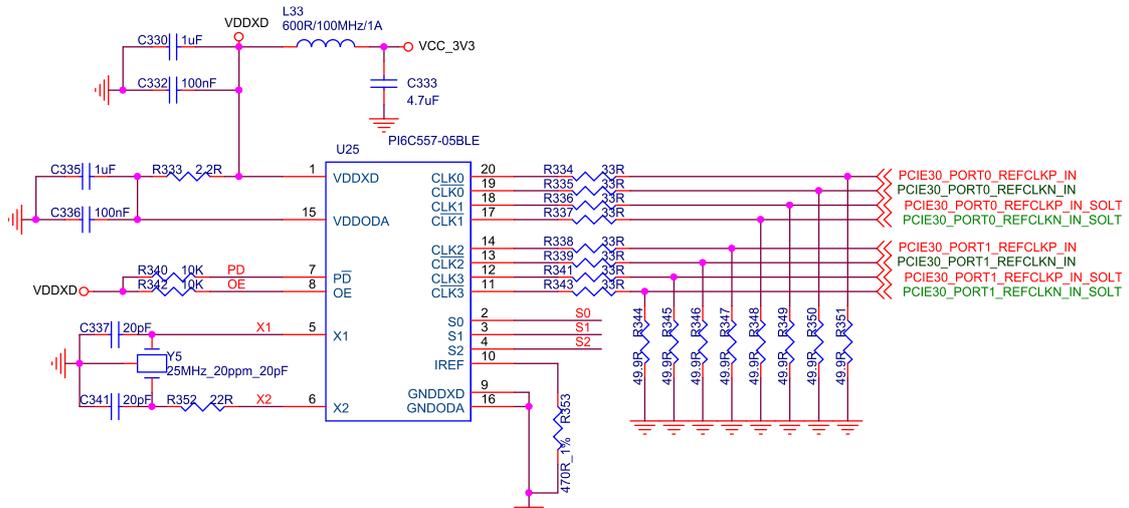


### 2.1.2 Debug Circuit

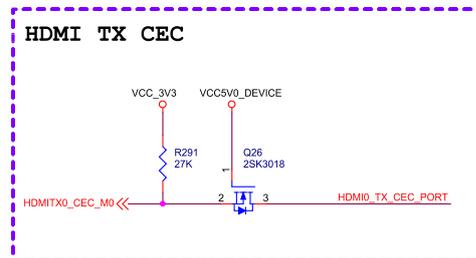
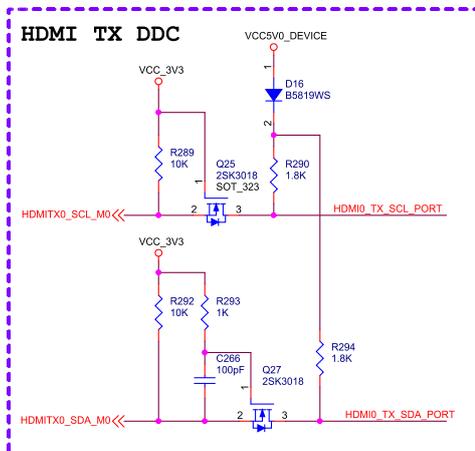
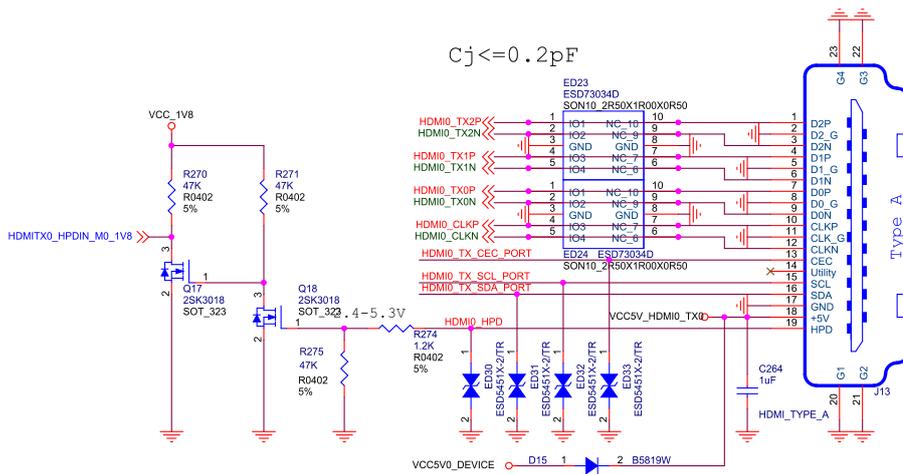




### 2.1.3 PCIe30 CLK Circuit



### 2.1.4 HDMI0 TX Circuit



## 2.2 Mother Board Length Offset

MIPI CSI0 4-Lane Interface length offset

|                    |                   |          |       |
|--------------------|-------------------|----------|-------|
| MIPI_CSI0_RX0_CLKP | MIPI_CSI0_RX0_D0P | (-17.88) |       |
|                    | MIPI_CSI0_RX0_D1P | (-6.98)  |       |
|                    | MIPI_CSI0_RX0_D2P | (121.62) | (100) |
|                    | MIPI_CSI0_RX0_D3P | (126.26) | (100) |

MIPI CSI1 4-Lane Interface length offset

|                    |                   |           |        |
|--------------------|-------------------|-----------|--------|
| MIPI_CSI1_RX0_CLKP | MIPI_CSI1_RX0_D0P | (-6.31)   |        |
|                    | MIPI_CSI1_RX0_D1P | (-16.71)  |        |
|                    | MIPI_CSI1_RX0_D2P | (-111.62) | (-100) |
|                    | MIPI_CSI1_RX0_D3P | (-120.24) | (-100) |

**Yellow block** is Mini3588 CSI0 group length difference.

Unit: mil

## 2.3 B2B Connector

The carrier board and CPU module are connected via board-to-board (BTB) connectors. The receptacle (**5177983-6**) is on the CPU module, and the plug (**5179031-6**) is on the baseboard.



**5177983-6**  
Receptacle

**5179031-6**  
Plug



## 3 Product Electrical Characteristics

### 3.1 Dissipation and Temperature

| Symbol               | Parameter              | Min  | Typ  | Max | Unit |
|----------------------|------------------------|------|------|-----|------|
| VCC_SYS              | System IO Voltage      | 3.3V | 4    | 4.5 | V    |
| I <sub>sys_in</sub>  | VCC_SYS input Current  |      | 3100 |     | mA   |
| VCC_RTC              | RTC Voltage            | 1.8  | 3    | 3.4 | V    |
| I <sub>rtc</sub>     | RTC input Current      |      | 5    | 8   | uA   |
| I <sub>3v3_out</sub> | VCC_3V3 output Current |      |      | 500 | mA   |
| I <sub>1v8_out</sub> | VCC_1V8 output Current |      |      | 500 | mA   |
| T <sub>a</sub>       | Operating Temperature  | -40  |      | 85  | °C   |
| T <sub>stg</sub>     | Storage Temperature    | -40  |      | 85  | °C   |

### 3.2 Reliability of Test

| High Temperature Operating Test |                                  |            |
|---------------------------------|----------------------------------|------------|
| Contents                        | Operating 8h in high temperature | 55°C ± 2°C |
| Result                          | PASS                             |            |

| Operating Life Test |                   |      |
|---------------------|-------------------|------|
| Contents            | Operating in room | 120h |
| Result              | PASS              |      |