

# *CM311Y3 Reference User Manual*

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V1.202608



**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 do not 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 made 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 CM311Y3 Introduction

## 1.1 Summary

The CM311Y3 system-on-module is equipped with Amlogic's A311Y3. It has a dual-core Cortex-A78 and a hexa-core Cortex-A55 processor, embedded Mali-G625 MC1 GPU and 8.0 TOPs NPU.

It is designed specifically for the high-performance devices such as 4K video surveillance system, AI Edge calculation devices, intelligent interactive devices, personal computers and robots. The high-performance multimedia processing and acceleration engine solution can help customers to introduce new technologies more quickly and enhance the overall solution efficiency.

## 1.2 Features

- **Microprocessor**
  - Dual-core Cortex-A78 up to 2.4GHz
  - Hexa-core Cortex-A55 up to 2.0GHz
  - 64KB I-cache 64KB D-cache and 256KB L2 for A78 each core, 32KB I-cache 32KB D-cache and 128KB L2 for A55 each core, and shared 2MB L3 cache
  - 8.0 TOPS Neural Process Unit
  - Mali-G625 MC1 up to 1.0GHz
  - Built in RISC-V for system control and power management
- **Memory Organization**
  - LPDDR5 RAM up to 16GB
  - EMMC up to 256GB
  - Support FSPI Flash
- **Boot ROM**
  - Supports system code download through USB OTG
- **Secure system**
  - Trust Zone based Trusted Execution Environment
  - Support secure boot, encrypted OTP, encrypted DRAM.
  - Support Hardware Key ladder and internal control buses and storage.
  - Support Hardware based Trusted Video Path, video watermarking and secured contents.
- **Video Decoder/Encoder**
  - Supports video decoding up to 4Kx2K@120fps
  - Supports H.264/265 encode up to 4Kx2K@60fps
  - MJPEG encoding up to 4Kx2K@30fps
- **Display Subsystem**
  - **Video Output**  
Supports HDMI 2.1a TX with ARC, up to 3840x2160@60Hz  
Supports EDP1.3 TX interface up to 3840x2160@60Hz  
Supports 2x4 lanes MIPI DSI up to 2560x1600@60Hz or 1920x1080@120Hz  
Or dual-LVDS or sign channel TX up to 1080P@60Hz



Or V-by-One TX 3860x2160@60Hz  
Supports PD1.4a interface up to 3860x2160@60Hz

- **Video/Image Input**

Supports up to 3-CH MIPI CSI interfaces  
2-CH MIPI 2lanes or 1-CH 4lanes interfaces  
1-CH 4lanes CSI interfaces

- **Audio**

- Three I2S/PCM interfaces
- Support Mic array Up to 8ch PDM/TDM interface
- Support 2-ch SPDIF output
- Support 1-ch SPDIF input
- Support voice event detection
- Option support HIFI5 DSP

- **USB / PCIE/SATA3**

- One Type-C or DP interfaces
- One USB3.0 Host or PCIE2.0 1x or HSGMII interface.
- One PCIE3.0 2x or Two PCIE3.0 1x interfaces.
- One USB2.0 Host interface

- **Ethernet**

- Support up to three Ethernet interface
- One 1GB RGMII and One 2.5GB HSGMII interfaces
- On board RTL8211F

- **I2C**

- Up to 8-CH I2C (I2C\_A already used for RTC)
- Support standard mode and fast mode (up to 400kbit/s)

- **I3C**

- Up to 2-CH I3C
- Support HDR mode
- I2C compatible

- **SDIO / SDMMC**

- Support SDIO 3.0 protocol
- Support SD3.0 card

- **SPI**

- Up to 4-ch SPI controllers,
- Full-duplex synchronous serial interface

- **UART**

- Support up to 5 UARTs
- UART\_B with 2 wires for debug
- Support high baud rates up to 4M bps

- **CAN**

- Up to 2-CH CAN controller
- Support CAN FD protocol

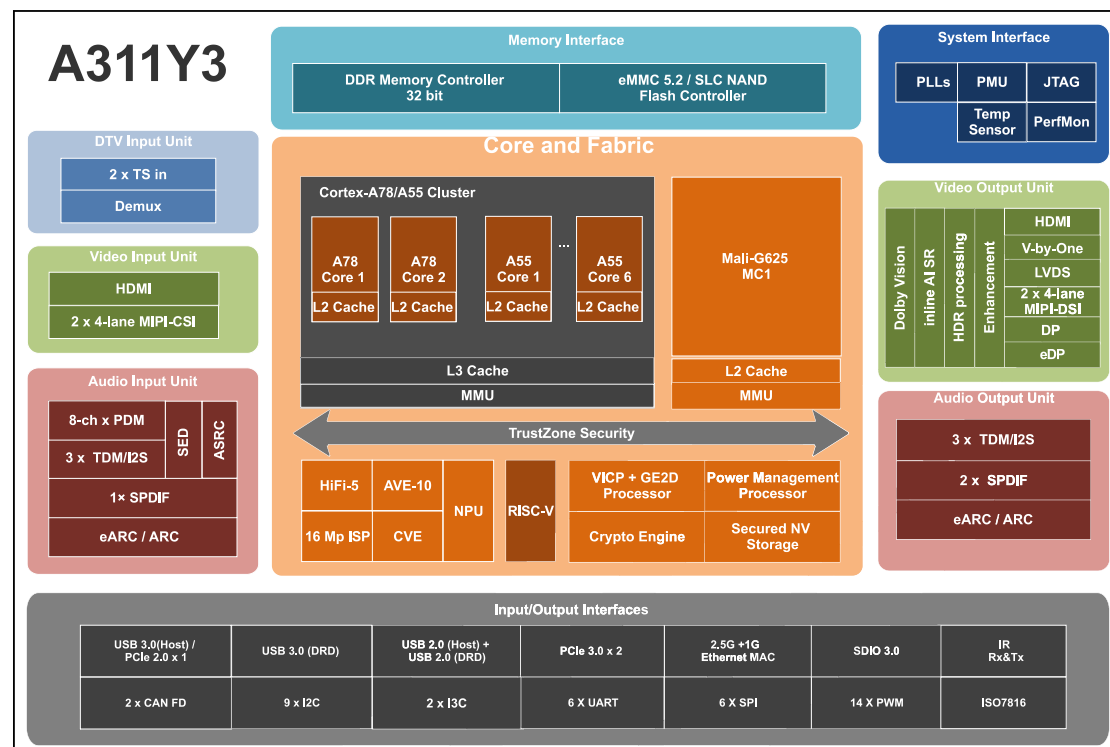
- **ADC**

- 1-CH ADC channels

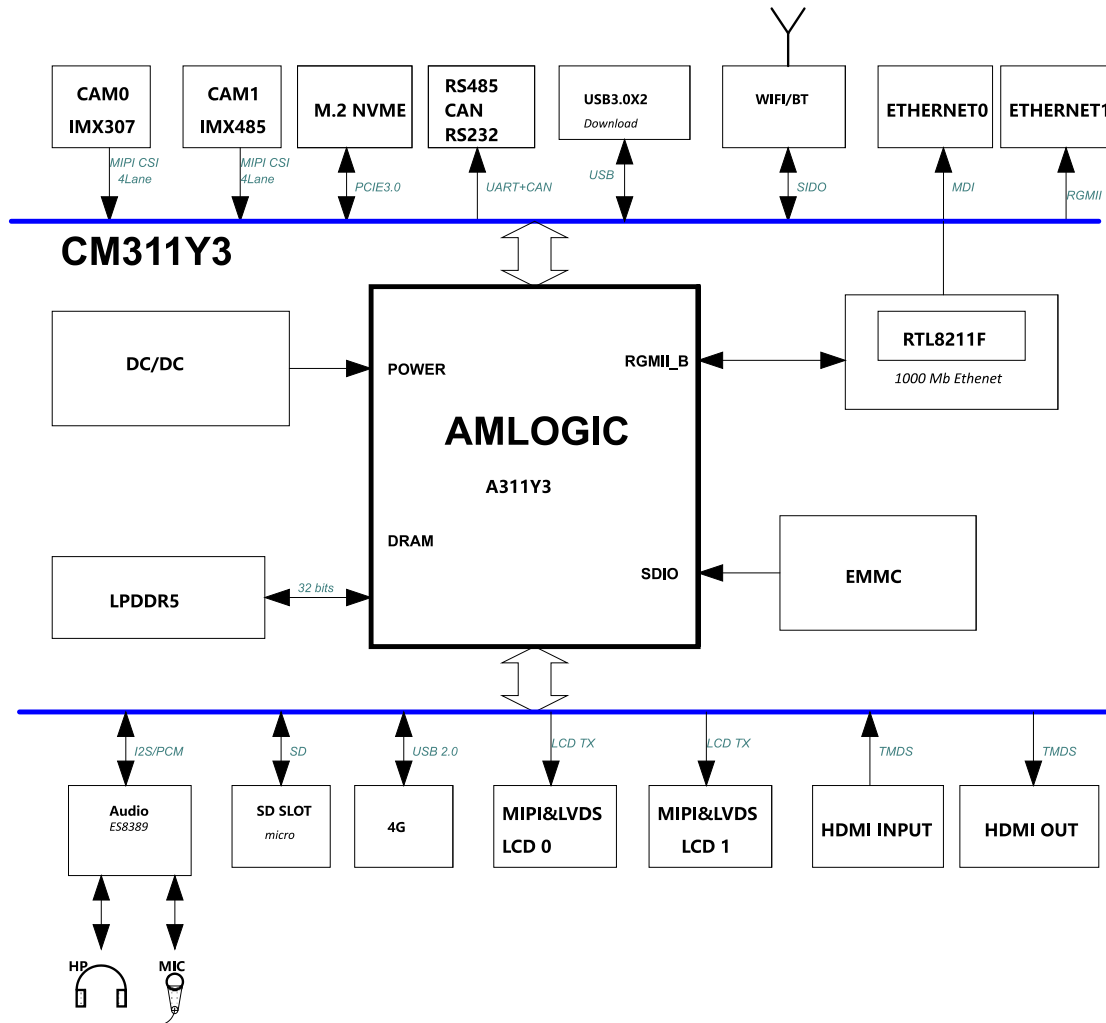
- 10-bit resolution
- Voltage input range between 0V to 1.8V
- **PWM**
  - Up to 14 PWMs
- **Power unit**
  - Discrete Power on board
  - 3.4 ~ 5.5V main power input
  - Power enable control input
  - Very low RTC consume current, less 5uA at 3V button Cell.

## 1.3 CM311Y3 Block Diagram

### 1.3.1 A311Y3 Block Diagram



### 1.3.2 Development board (idea311Y3) Block Diagram

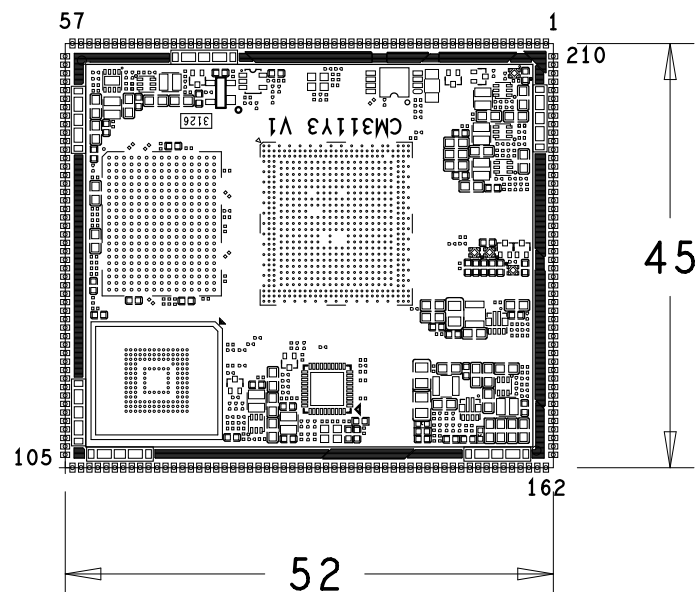


## 1.4 CM311Y3 specifications

| Feature       | Specifications                                                    |
|---------------|-------------------------------------------------------------------|
| CPU           | Quad-core Cortex-A78 and quad-core Cortex-A55                     |
| DDR           | 4GB LPDDR5 (up to 16GB)                                           |
| eMMC FLASH    | 64GB (up to 256GB)                                                |
| Power         | DC 3.4 ~ 5.5V                                                     |
| VX1(V-by-One) | 1-CH (Cannot use MIPI/LVDS/eDP, if VX1 setting.)                  |
| I2S           | 3-CH                                                              |
| MIPI CSI      | 2-CH 4-Lane or 2-CH 2-Lane + 1-CH 4-Lan CSI (up to 3 CSI Cameras) |
| HDMI output   | 1-CH                                                              |
| DP output     | 1-CH                                                              |
| eDP output    | 1-CH (Cannot use MIPI/LVDS dual channel, if eDP setting.)         |
| MIPI DSI/LVDS | 2-CH (option)                                                     |

| Feature         | Specifications                                     |
|-----------------|----------------------------------------------------|
| CAN             | 2-CH                                               |
| USB             | 1-CH Type-C + 1-CH USB Host3.0 + 1-CH USB Host 2.0 |
| Ethernet        | 1-CH 1GB PHY + 1-CH RGMII + 1-CH HSGMII (option)   |
| SDIO            | 2-CH                                               |
| SPDIF TX        | 2-CH                                               |
| SPDIF RX        | 1-CH                                               |
| I2C             | 8-CH                                               |
| I3C             | 2-CH                                               |
| SPI             | 4-CH                                               |
| UART            | 4-CH, 1-CH(DEBUG)                                  |
| PWM             | 14-CH                                              |
| ADC IN          | 1-CH                                               |
| Board Dimension | 52 x 45mm                                          |

## 1.5 CM311Y3 PCB Dimension



## 1.6 CM311Y3 Pin Definition

| Pin | Signal               | Description or functions      | GPIO serial | IO Voltage |
|-----|----------------------|-------------------------------|-------------|------------|
| 1   | ETH_A_RGMII_TXD2_1V8 | TSIN_B_D6/SPIB_SCLK/TDM_SCLK2 | GPIOZ_12_d  | 1.8V       |
| 2   | ETH_A_RGMII_TXD3_1V8 | TSIN_B_D7/SPIB_SS0/TDM_FS2    | GPIOZ_13_d  | 1.8V       |





| Pin | Signal                          | Description or functions | GPIO serial | IO Voltage |
|-----|---------------------------------|--------------------------|-------------|------------|
| 3   | GND                             | Ground                   |             | 0V         |
| 4   | PCIE30_LANE1_TXP                | Or PCIE30_LANE0_TXP1     |             | 0.5V       |
| 5   | PCIE30_LANE1_TXN                | Or PCIE30_LANE0_TXN1     |             | 0.5V       |
| 6   | PCIE30_LANE1_RXP                | Or PCIE30_LANE0_RXP1     |             | 0.5V       |
| 7   | PCIE30_LANE1_RXN                | Or PCIE30_LANE0_RXN1     |             | 0.5V       |
| 8   | PCIE30_LANE1_PCIE<br>20_REFCLKP |                          |             | 0.5V       |
| 9   | PCIE30_LANE1_PCIE<br>20_REFCLKN |                          |             | 0.5V       |
| 10  | PCIE30_LANE0_RXP                | PCIE30_LANE0_RXP0        |             | 0.5V       |
| 11  | PCIE30_LANE0_RXN                | PCIE30_LANE0_RXN0        |             | 0.5V       |
| 12  | PCIE30_LANE0_TXP                | PCIE30_LANE0_TXP0        |             | 0.5V       |
| 13  | PCIE30_LANE0_TXN                | PCIE30_LANE0_TXN0        |             | 0.5V       |
| 14  | PCIE30_LANE0_REFC<br>LK_P       |                          |             | 0.5V       |
| 15  | PCIE30_LANE0_REFC<br>LK_N       |                          |             | 0.5V       |
| 16  | GND                             | Ground                   |             | 0V         |
| 17  | HSGMII_USB_B_SS_P<br>Cle20_TXP  | For HSGMII/ USB3/ PCIe20 |             | 0.5V       |
| 18  | HSGMII_USB_B_SS_P<br>Cle20_TXN  | For HSGMII/ USB3/ PCIe20 |             | 0.5V       |
| 19  | HSGMII_USB_B_SS_P<br>Cle20_RXP  | For HSGMII/ USB3/ PCIe20 |             | 0.5V       |
| 20  | HSGMII_USB_B_SS_P<br>Cle20_RXN  | For HSGMII/ USB3/ PCIe20 |             | 0.5V       |
| 21  | USB_A_TYPEC_RX1N<br>/DP_TX_D3N  | For TYPEC or DP          |             | 0.5V       |
| 22  | USB_A_TYPEC_RX1P/<br>DP_TX_D3P  | For TYPEC or DP          |             | 0.5V       |
| 23  | USB_A_TYPEC_TX1N/<br>DP_TX_D2N  | For TYPEC or DP          |             | 0.5V       |
| 24  | USB_A_TYPEC_TX1P/<br>DP_TX_D2P  | For TYPEC or DP          |             | 0.5V       |
| 25  | USB_A_TYPEC_RX2N<br>/DP_TX_D0N  | For TYPEC or DP          |             | 0.5V       |
| 26  | USB_A_TYPEC_RX2P/<br>DP_TX_D0P  | For TYPEC or DP          |             | 0.5V       |
| 27  | USB_A_TYPEC_TX2N/<br>DP_TX_D1N  | For TYPEC or DP          |             | 0.5V       |
| 28  | USB_A_TYPEC_TX2P/<br>DP_TX_D1P  | For TYPEC or DP          |             | 0.5V       |



| Pin | Signal                  | Description or functions                                              | GPIO serial                            | IO Voltage |
|-----|-------------------------|-----------------------------------------------------------------------|----------------------------------------|------------|
| 29  | DP_TX_AUXN_USB_S<br>BU2 | For TYPEC CC2 or DP                                                   | H/W Can change to<br>I2C_F_SDA (Note1) | 0.5V/3.3V  |
| 30  | DP_TX_AUXP_USB_S<br>BU1 | For TYPEC CC1 or DP                                                   | H/W Can change to<br>I2C_F_SCL (Note1) | 0.5V/3.3V  |
| 31  | GND                     | Ground                                                                |                                        | 0V         |
| 32  | SD_CLK                  | JTAG_B_CLK/SPID_SS1/I2C<br>_A_SCL/PDMD_CLK                            | GPIOC_4_u<br>/RT_GPIO_18               | 1.8V/3.3V  |
| 33  | SD_D1                   | JTAG_B_TDI/SPID_MISO/I2<br>C_C_SDA/PDMD_DIN1/UAR<br>T_D_RTS/I3C_A_SDA | GPIOC_1_u                              | 1.8V/3.3V  |
| 34  | SD_CMD                  | JTAG_B_TMS/SPID_SS2/I2<br>C_A_SDA/UART_D_RX                           | GPIOC_5_u                              | 1.8V/3.3V  |
| 35  | SD_D0                   | JTAG_B_TDO/SPID_MOSI/I<br>2C_C_SCL/PDMD_DIN0/UA<br>RT_D_CTS/I3C_A_SCL | GPIOC_0_u                              | 1.8V/3.3V  |
| 36  | SD_D3                   | SPID_SS0/I2C_B_SDA/PDM<br>D_DIN3                                      | GPIOC_3_u<br>/RT_GPIO_17               | 1.8V/3.3V  |
| 37  | SD_D2                   | SPID_SCLK/I2C_B_SCL/PD<br>MD_DIN2                                     | GPIOC_2_u<br>/RT_GPIO_16               | 1.8V/3.3V  |
| 38  | Vbutt                   | RTC Battery input                                                     |                                        | 3.0V       |
| 39  | USB_C_DP                |                                                                       |                                        | 0.5V       |
| 40  | USB_C_DM                |                                                                       |                                        | 0.5V       |
| 41  | USB_B_DP                |                                                                       |                                        | 0.5V       |
| 42  | USB_B_DM                |                                                                       |                                        | 0.5V       |
| 43  | USB_A_TYPEC_DP          |                                                                       |                                        | 0.5V       |
| 44  | USB_A_TYPEC_DM          |                                                                       |                                        | 0.5V       |
| 45  | GND                     | Ground                                                                |                                        | 0V         |
| 46  | RTC32KO_1V8             | RTC32.768K output for WIFI                                            | (PU10K)                                | 1.8V       |
| 47  | USB_A_OTG_VBUS          |                                                                       |                                        | 1.8V       |
| 48  | USB_A_OTG_ID            | (Connect to GND if not used)                                          | (PU in core)                           | 1.8V       |
| 49  | CARD_DET                | GEN_CLK_OUT/PCIE_CLKA<br>_REQN/UART_D_TX                              | GPIOC_6_u                              | 1.8V/3.3V  |
| 50  | GPIOD_8_d               | JTAG_A_CLK/IR_OUT/UART<br>_E_TX                                       | GPIOD_8_d                              | 3.3V       |
| 51  | GPIOD_9_u               | JTAG_A_TMS/IR_IN/UART<br>_E_RX                                        | GPIOD_9_u                              | 3.3V       |
| 52  | GPIOD_13_d              | I2C_C_SCL/SPDIF_OUT/IN                                                | GPIOD_13_d<br>/RT_GPIO_6               | 3.3V       |
| 53  | IR_IN                   | RT_GPIO_2                                                             | GPIOD_5_u                              | 3.3V       |
| 54  | DBG_UART_B_TX           |                                                                       | GPIOD_0_u                              | 3.3V       |



| Pin | Signal              | Description or functions                                      | GPIO serial                       | IO Voltage |
|-----|---------------------|---------------------------------------------------------------|-----------------------------------|------------|
| 55  | DBG_UART_B_RX       |                                                               | GPIOD_1_u                         | 3.3V       |
| 56  | GPIOD_10_u          | PMW_A/C_HIZ/JTAG_A_TDI<br>/UART_E_CTS                         | GPIOD_10_u<br>/RT_GPIO_4          | 3.3V       |
| 57  | GPIOD_15_u          | PMIC_SLEEP/STR_EN                                             | GPIOD_15_u                        | 3.3V       |
| 58  | HDMI_CEC            | I2C_C_SDA/WD_RSTO                                             | GPIOD_14_od<br>/RT_GPIO_7 (Note2) | 3.3V       |
| 59  | POWER_KEY           |                                                               | GPIOD_3_u                         | 3.3V       |
| 60  | GPIOD_11_u          | SPDIF_IN/PMW_G_HIZ/JTAG_A_TDO/UART_E_RTS                      | GPIOD_11_u<br>/RT_GPIO_5          | 3.3V       |
| 61  | WD_RSTO             | WD_RSTO/HDMI_CEC                                              | GPIOD_17_od                       | 3.3V       |
| 62  | RESETn_IN           | System Reset input                                            | (PU10K)                           | 3.3V       |
| 63  | USB_BOOT_H          | 1: USB Boot Frist (Download)<br>0/N.C: EMMC Boot Frist        | (PD4K7) (Note3)                   | 1.8V/3.3V  |
| 64  | GND                 | Ground                                                        |                                   | 0V         |
| 65  | ETH_A_MDIO_1V8      | ISO7816_CLK/SPI_E_MOSI/<br>TDM_SCLK1/I2C_E_SDA/U<br>ART_D_CTS | GPIOZ_0_u                         | 1.8V       |
| 66  | ETH_A_MDC_1V8       | ISO7816_DATA/SPI_E_MISO/TDM1_FS/I2C_E_SCL/UART_D_RTS          | GPIOZ_1_u                         | 1.8V       |
| 67  | GPIOA_12_d_1V8      | I2C_D_SDA/RT_GPIO_15                                          | GPIOA_12_d                        | 1.8V       |
| 68  | GPIOA_11_d_1V8      | I2C_D_SCL/PWM_A/RT_GPIO_14                                    | GPIOA_11_d                        | 1.8V       |
| 69  | GPIOA_7_u_1V8       | I2C_C_SDA/PDM_DIN1                                            | GPIOA_7_u                         | 1.8V       |
| 70  | GPIOA_10_u_1V8      | PDM_CLK                                                       | GPIOA_10_u                        | 1.8V       |
| 71  | GPIOA_6_d_1V8       | I2C_C_SCL/PDM_DIN0/PWM_G                                      | GPIOA_6_d                         | 1.8V       |
| 72  | GPIOA_8_u_1V8       | PDM_DIN2                                                      | GPIOA_8_u                         | 1.8V       |
| 73  | CAN_A_TX_1V8        | SPDIF_IN/I3C_A_SDA                                            | GPIOA_18_d                        | 1.8V       |
| 74  | BT_UART_A_CTS_N_1V8 |                                                               | GPIOX_13_u                        | 1.8V       |
| 75  | BT_UART_A_RTS_N_1V8 |                                                               | GPIOX_14_u                        | 1.8V       |
| 76  | BT_UART_A_TX_1V8    |                                                               | GPIOX_11_u                        | 1.8V       |
| 77  | BT_UART_A_RX_1V8    |                                                               | GPIOX_12_u                        | 1.8V       |
| 78  | CAN_A_RX_1V8        | I3C_A_SCL                                                     | GPIOA_19_d                        | 1.8V       |
| 79  | BTPCM_CLK_1V8       | TDM_SCLK0                                                     | GPIOX_10_u                        | 1.8V       |
| 80  | BTPCM_DIN_1V8       | TDM_D1                                                        | GPIOX_7_u                         | 1.8V       |
| 81  | BTPCM_DOUT_1V8      | TDM_D0                                                        | GPIOX_8_u                         | 1.8V       |
| 82  | BTPCM_SYNC_1V8      | TDM_FS0                                                       | GPIOX_9_u                         | 1.8V       |
| 83  | GND                 | Ground                                                        |                                   | 0V         |



| Pin | Signal                   | Description or functions                         | GPIO serial          | IO Voltage |
|-----|--------------------------|--------------------------------------------------|----------------------|------------|
| 84  | PANEL_B_VDD_EN/VX1_LOCKN | TDM_D6/RT_GPIO_35                                | GPIOY_7_d            | 3.3V       |
| 85  | DP_HPD                   | TDM_D7/I2C_I_SDA/RT_GPIO_36                      | GPIOY_8_u            | 3.3V       |
| 86  | eDP_HPD/VX1_HPD          | TDM_D8/I2C_I_SCL/RT_GPIO_37                      | GPIOY_9_u            | 3.3V       |
| 87  | SPDIFOUT_GPIOY_4_d       | PWM_M/TDM_MCLK1/PDM_D3                           | GPIOY_4_d            | 3.3V       |
| 88  | PANEL_A_RST              | PWM_K/TDM_FS1/PDM_D1/PCIE_A_PRST                 | GPIOY_2_d/RT_GPIO_32 | 3.3V       |
| 89  | PANEL_A_VDD_EN           | PWM_L/TDM_SCLK1/PDM_D2/SPDIF_IN/PCIE_B_PRST      | GPIOY_3_d            | 3.3V       |
| 90  | PANEL_A_BL_PWM_I         | PWM_I/TDM_D3/PDM_DCLK/PCIE_B_REQN                | GPIOY_1_d/RT_GPIO_31 | 3.3V       |
| 91  | PANEL_A_BL_EN            | PWM_N/TDM_D2/PDM_DIN0/PCIE_A_REQN                | GPIOY_0_d/RT_GPIO_30 | 3.3V       |
| 92  | HDMIRX_HPD               |                                                  | GPIOH_2_od           | 3.3V/5V    |
| 93  | HDMIRX_SDA               | UART_C_TX/CAN_B_TX                               | GPIOH_0_od           | 5V         |
| 94  | HDMIRX_SCL               | UART_C_RX/CAN_B_RX                               | GPIOH_1_od           | 5V         |
| 95  | HDMITX_SDA               | I2C_F_SDA/PWM_M/PCIECK_A_REQN                    | GPIOH_4_od           | 5V         |
| 96  | HDMITX_SCL               | I2C_F_SCL/PWM_VS/PCIECK_B_REQN/DP_HPD            | GPIOH_5_od           | 5V         |
| 97  | GND                      | Ground                                           |                      | 0V         |
| 98  | CMA_PWRDN_1V8            | I2C_E_SCL/UART_D_RX/TDM_MCLK2/PDM_DIN2/SPI_C_SS0 | GPIOM_3_d            | 1.8V       |
| 99  | CMA_RST_L_1V8            | I2C_E_SDA/UART_D_TX/TDM_D11/PDM_DIN1/SPI_C_SCLK  | GPIOM_2_d            | 1.8V       |
| 100 | CMC_RST_L_1V8            | I2C_F_SDA/UART_F_TX/TDM_SCLK2/PDM_DIN3/PWM_J     | GPIOM_4_d            | 1.8V       |
| 101 | CMC_PWRDN_1V8            | I2C_F_SCL/UART_F_RX/TDM_FS2/PCIECK_B_REQN/PWM_VS | GPIOM_5_d            | 1.8V       |
| 102 | CMC_I2C_H_SCL_1V8        | I2C_H_SCL/UART_F_RTS/TDM_D15/EDP_HPD/VX1_HTPDN   | GPIOM_7_d            | 1.8V       |
| 103 | CMC_I2C_H_SDA_1V8        | I2C_H_SDA/UART_F_CTS/TDM_D14/DP_HPD/VX1_LOCKN    | GPIOM_6_d            | 1.8V       |



| Pin | Signal                    | Description or functions                                               | GPIO serial | IO Voltage |
|-----|---------------------------|------------------------------------------------------------------------|-------------|------------|
| 104 | CMA_I2C_G_SDA_1V8         | I2C_G_SDA/UART_D_CTS/<br>TDM_D9/PDM_DIN0/SPI_C_<br>MOSI                | GPIO_M_0_d  | 1.8V       |
| 105 | CMA_I2C_G_SCL_1V8         | I2C_G_SCL/UART_D_RTS/T<br>DM_D10/PDM_DCLK/SPI_C_<br>_MISO              | GPIO_M_1_d  | 1.8V       |
| 106 | MDI-BI_DDN                | ETH_B_MDI                                                              |             | 0.5V       |
| 107 | MDI-BI_DDP                | ETH_B_MDI                                                              |             | 0.5V       |
| 108 | MDI-BI_DCN                | ETH_B_MDI                                                              |             | 0.5V       |
| 109 | MDI-BI_DCP                | ETH_B_MDI                                                              |             | 0.5V       |
| 110 | MDI-BI_DBN                | ETH_B_MDI                                                              |             | 0.5V       |
| 111 | MDI-BI_DBP                | ETH_B_MDI                                                              |             | 0.5V       |
| 112 | MDI-BI_DAN                | ETH_B_MDI                                                              |             | 0.5V       |
| 113 | MDI-BI_DAP                | ETH_B_MDI                                                              |             | 0.5V       |
| 114 | LED1_CFG_LDO0             | ETH_B_LED+                                                             | (PD4K7)     | 3.3V       |
| 115 | LED2_CFG_LDO1             | ETH_B_LED-                                                             | (PU4K7)     | 3.3V       |
| 116 | GND                       | Ground                                                                 |             | 0V         |
| 117 | WIFI_SDIO_D1_1V8          | I3C_B_SDA_D0/I2C_I_SCL<br>/TDM_D7/PDM_DIN1/TSIN_<br>B_SOP/ISO7816_DATA | GPIOX_1_u   | 1.8V       |
| 118 | WIFI_SDIO_D0_1V8          | I3C_B_SDA_D1/I2C_I_SDA<br>/TDM_D6/PDM_DIN0/TSIN_<br>B_DIN0/ISO7816_CLK | GPIOX_0_u   | 1.8V       |
| 119 | WIFI_SDIO_D2_1V8          | I3C_B_SCL/I2C_H_SDA<br>/TDM_FS1/D8/PDM_DIN2/T<br>SIN_B_VALID           | GPIOX_2_u   | 1.8V       |
| 120 | WIFI_SDIO_D3_1V8          | I3C_B_SDA_D2/I2C_H_SCL<br>/TDM_SCLK1/D9/PDM_DIN3<br>/TSIN_B_CLK        | GPIOX_3_u   | 1.8V       |
| 121 | WIFI_SDIO_CMD_1V8         | TDM_D4/PWM_C                                                           | GPIOX_5_u   | 1.8V       |
| 122 | WIFI_SDIO_CLK_1V8         | I3C_B_SDA_D3/TDM_MCLK<br>1/PDM_DCLK                                    | GPIOX_4_u   | 1.8V       |
| 123 | GND                       | Ground                                                                 |             | 0V         |
| 124 | DSI_B_D3P/LVDS_B_3<br>P   | MIPI_DSI or LVDS                                                       |             | 0.5V       |
| 125 | DSI_B_D3N/LVDS_B_3<br>N   | MIPI_DSI or LVDS                                                       |             | 0.5V       |
| 126 | DSI_B_D2P/LVDS_B_<br>CLKP | MIPI_DSI or LVDS                                                       |             | 0.5V       |
| 127 | DSI_B_D2N/LVDS_B_<br>CLKN | MIPI_DSI or LVDS                                                       |             | 0.5V       |



| Pin | Signal                                  | Description or functions | GPIO serial | IO Voltage |
|-----|-----------------------------------------|--------------------------|-------------|------------|
| 128 | DSI_B_CKP/LVDS_B_2P/VX1_A_7P            | MIPI_DSI/ LVDS/ VX1      |             | 0.5V       |
| 129 | DSI_B_CKN/LVDS_B_2N/VX1_A_7N            | MIPI_DSI/ LVDS/ VX1      |             | 0.5V       |
| 130 | DSI_B_D1P/LVDS_B_1P/VX1_A_6P            | MIPI_DSI/ LVDS/ VX1      |             | 0.5V       |
| 131 | DSI_B_D1N/LVDS_B_1N/VX1_A_6N            | MIPI_DSI/ LVDS/ VX1      |             | 0.5V       |
| 132 | DSI_B_D0P/LVDS_B_0P/VX1_A_5P            | MIPI_DSI/ LVDS/ VX1      |             | 0.5V       |
| 133 | DSI_B_D0N/LVDS_B_0N/VX1_A_5N            | MIPI_DSI/ LVDS/ VX1      |             | 0.5V       |
| 134 | GND                                     | Ground                   |             | 0V         |
| 135 | EDP_A_3P/DSI_A_D3P/LVDS_A_3P/VX1_A_4P   | EDP/ MIPI_DSI/ LVDS/ VX1 |             | 0.5V       |
| 136 | EDP_A_3N/DSI_A_D3N/LVDS_A_3N/VX1_A_4N   | EDP/ MIPI_DSI/ LVDS/ VX1 |             | 0.5V       |
| 137 | EDP_A_2P/DSI_A_D2P/LVDS_A_CLKP/VX1_A_3P | EDP/ MIPI_DSI/ LVDS/ VX1 |             | 0.5V       |
| 138 | EDP_A_2N/DSI_A_D2N/LVDS_A_CLKN/VX1_A_3N | EDP/ MIPI_DSI/ LVDS/ VX1 |             | 0.5V       |
| 139 | EDP_A_1P/DSI_A_CKP/LVDS_A_2P/VX1_A_2P   | EDP/ MIPI_DSI/ LVDS/ VX1 |             | 0.5V       |
| 140 | EDP_A_1N/DSI_A_CKN/LVDS_A_2N/VX1_A_2N   | EDP/ MIPI_DSI/ LVDS/ VX1 |             | 0.5V       |
| 141 | EDP_A_0P/DSI_A_D1P/LVDS_A_1P/VX1_A_1P   | EDP/ MIPI_DSI/ LVDS/ VX1 |             | 0.5V       |
| 142 | EDP_A_0N/DSI_A_D1N/LVDS_A_1N/VX1_A_1N   | EDP/ MIPI_DSI/ LVDS/ VX1 |             | 0.5V       |
| 143 | EDP_A_AUXP/DSI_A_D0P/LVDS_A_0P/VX1_A_0P | EDP/ MIPI_DSI/ LVDS/ VX1 |             | 0.5V       |
| 144 | EDP_A_AUXN/DSI_A_D0N/LVDS_A_0N/VX1_A_0N | EDP/ MIPI_DSI/ LVDS/ VX1 |             | 0.5V       |



| Pin | Signal                | Description or functions                       | GPIO serial        | IO Voltage |
|-----|-----------------------|------------------------------------------------|--------------------|------------|
| 145 | GND                   | Ground                                         |                    | 0V         |
| 146 | CSI_B_CLKN            |                                                |                    | 0.5V       |
| 147 | CSI_B_CLKP            |                                                |                    | 0.5V       |
| 148 | CSI_A_D3N             | Or MIPI_CSI_B_D1                               |                    | 0.5V       |
| 149 | CSI_A_D3P             | Or MIPI_CSI_B_D1                               |                    | 0.5V       |
| 150 | CSI_A_D2N             | Or MIPI_CSI_B_D0                               |                    | 0.5V       |
| 151 | CSI_A_D2P             | Or MIPI_CSI_B_D0                               |                    | 0.5V       |
| 152 | CSI_A_CLKN            |                                                |                    | 0.5V       |
| 153 | CSI_A_CLKP            |                                                |                    | 0.5V       |
| 154 | CSI_A_D1N             |                                                |                    | 0.5V       |
| 155 | CSI_A_D1P             |                                                |                    | 0.5V       |
| 156 | CSI_A_D0N             |                                                |                    | 0.5V       |
| 157 | CSI_A_D0P             |                                                |                    | 0.5V       |
| 158 | SARADC_CH1            |                                                |                    | 1.8V       |
| 159 | GND                   | Ground                                         |                    | 0V         |
| 160 | VCC_SYS               | Main Power Input                               |                    | 3.4-5.5V   |
| 161 | VCC_SYS               | Main Power Input                               |                    | 3.4-5.5V   |
| 162 | VCC_SYS               | Main Power Input                               |                    | 3.4-5.5V   |
| 163 | PWEN                  | System Power Control<br>(Float it if not used) | (PU100K)           | 3.4-5.5V   |
| 164 | HDMIRX_eARC_TXN       |                                                | (Had coupling CAP) | 5V         |
| 165 | HDMIRX_5VDET_eARC_TXP | Comb Port Power Detection                      | (Had coupling CAP) | 5V         |
| 166 | HDMITX_HPD_eARC_RXN   | Comb Port HPD                                  | (Had coupling CAP) | 5V         |
| 167 | HDMITX_eARC_RXP       |                                                | (Had coupling CAP) | 5V         |
| 168 | HDMIRX_A_CLKN         |                                                |                    | 0.5V       |
| 169 | HDMIRX_A_CLKP         |                                                |                    | 0.5V       |
| 170 | HDMIRX_A_D0N          |                                                |                    | 0.5V       |
| 171 | HDMIRX_A_D0P          |                                                |                    | 0.5V       |
| 172 | HDMIRX_A_D1N          |                                                |                    | 0.5V       |
| 173 | HDMIRX_A_D1P          |                                                |                    | 0.5V       |
| 174 | HDMIRX_A_D2N          |                                                |                    | 0.5V       |
| 175 | HDMIRX_A_D2P          |                                                |                    | 0.5V       |
| 176 | GND                   | Ground                                         |                    | 0V         |
| 177 | HDMI_TXCN             |                                                |                    | 0.5V       |
| 178 | HDMI_TXCP             |                                                |                    | 0.5V       |
| 179 | HDMI_TX0N             |                                                |                    | 0.5V       |
| 180 | HDMI_TX0P             |                                                |                    | 0.5V       |
| 181 | HDMI_TX1N             |                                                |                    | 0.5V       |
| 182 | HDMI_TX1P             |                                                |                    | 0.5V       |
| 183 | HDMI_TX2N             |                                                |                    | 0.5V       |



| Pin | Signal                 | Description or functions                                       | GPIO serial | IO Voltage |
|-----|------------------------|----------------------------------------------------------------|-------------|------------|
| 184 | HDMI_TX2P              |                                                                |             | 0.5V       |
| 185 | GND                    | Ground                                                         |             | 0V         |
| 186 | CMC_MCLK               | Camera C MCLK output                                           |             | 1.8V       |
| 187 | CMB_MCLK               | Camera B MCLK output                                           |             | 1.8V       |
| 188 | CMA_MCLK               | Camera A MCLK output                                           |             | 1.8V       |
| 189 | GND                    | Ground                                                         |             | 0V         |
| 190 | CSI_C_D0P              |                                                                |             | 0.5V       |
| 191 | CSI_C_D0N              |                                                                |             | 0.5V       |
| 192 | CSI_C_D1P              |                                                                |             | 0.5V       |
| 193 | CSI_C_D1N              |                                                                |             | 0.5V       |
| 194 | CSI_C_CLKP             |                                                                |             | 0.5V       |
| 195 | CSI_C_CLKN             |                                                                |             | 0.5V       |
| 196 | CSI_C_D2P              |                                                                |             | 0.5V       |
| 197 | CSI_C_D2N              |                                                                |             | 0.5V       |
| 198 | CSI_C_D3P              |                                                                |             | 0.5V       |
| 199 | CSI_C_D3N              |                                                                |             | 0.5V       |
| 200 | GND                    | Ground                                                         |             | 0V         |
| 201 | ETH_A_RGMII_RX_CLK_1V8 | TSIN_B_VALID/SPI_E_SCLK/TDM_D2/I2C_F_SDA/UART_D_TX             | GPIOZ_2_u   | 1.8V       |
| 202 | ETH_A_RGMII_RXDV_1V8   | TSIN_B_SOP/SPI_E_SS0/TDM1_D3/I2C_F_SCL/UART_D_RX               | GPIOZ_3_u   | 1.8V       |
| 203 | ETH_A_RGMII_RXD0_1V8   | TSIN_B_DIN0/SPI_E_MOSI/TDM_D4/I2C_G_SDA                        | GPIOZ_4_u   | 1.8V       |
| 204 | ETH_A_RGMII_RXD1_1V8   | TSIN_B_CLK/SPI_E_MISO/TDM_D5/I2C_G_SCL                         | GPIOZ_5_u   | 1.8V       |
| 205 | ETH_A_RGMII_RXD2_1V8   | TSIN_B_FAIL/TSIN_A_VALID/SPI_F_SCLK/TDM_D6/I2C_H_SDA/UART_E_TX | GPIOZ_6_u   | 1.8V       |
| 206 | ETH_A_RGMII_RXD3_1V8   | TSIN_B_DIN1/TSIN_A_SOP/SPI_F_SS0/TDM_D7/I2C_H_SCL/UART_E_RX    | GPIOZ_7_u   | 1.8V       |
| 207 | ETH_A_RGMII_TX_CLK_1V8 | TSIN_B_DIN2/TSIN_A_CLK/SPI_B_SS2/TDM_D8/UART_E_CTS             | GPIOZ_8_u   | 1.8V       |
| 208 | ETH_A_RGMII_TXEN_1V8   | TSIN_B_DIN3/TSIN_A_DIN0/SPI_B_SS1/TDM_D9/UART_E_RTS            | GPIOZ_9_d   | 1.8V       |
| 209 | ETH_A_RGMII_TXD0_1V8   | TSIN_B_DIN4/ISO7816_CLK/SPI_B_MOSI/TDM_D10                     | GPIOZ_10_d  | 1.8V       |

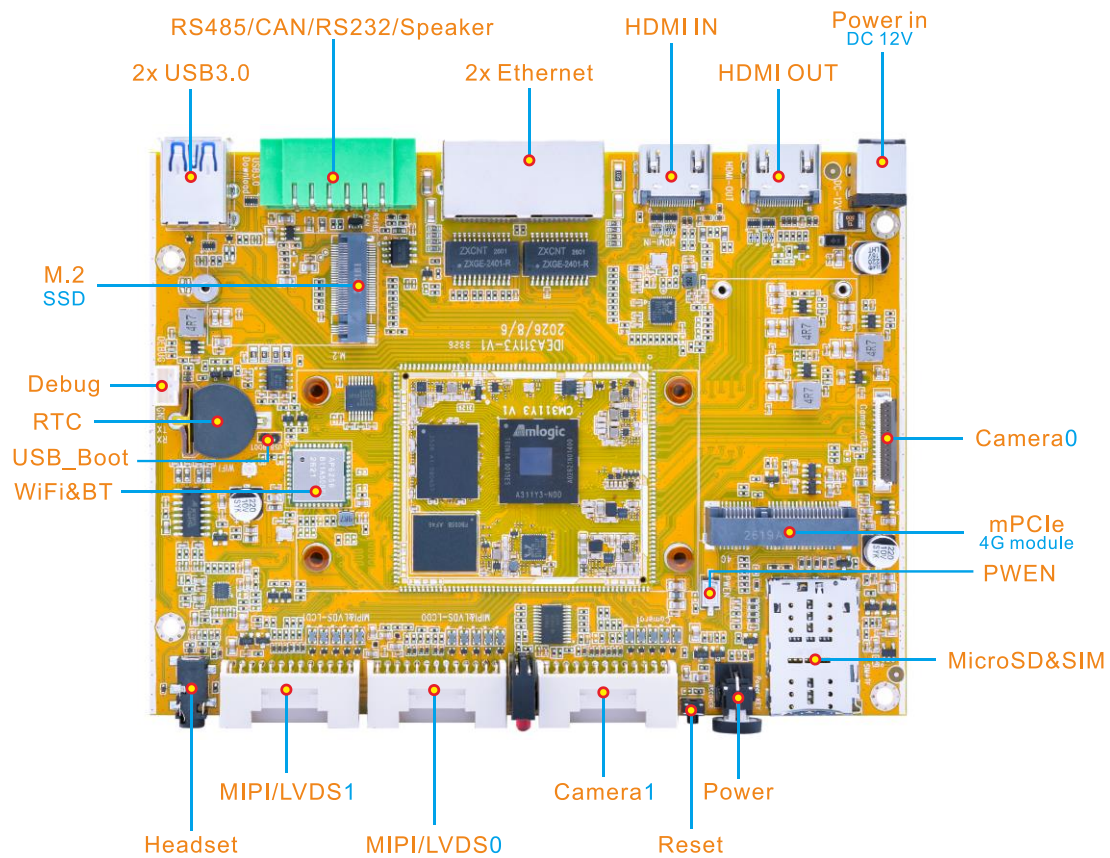


| Pin | Signal               | Description or functions                         | GPIO serial | IO Voltage |
|-----|----------------------|--------------------------------------------------|-------------|------------|
| 210 | ETH_A_RGMII_TXD1_1V8 | TSIN_B_DIN5/ISO7816_DAT<br>A/SPI_B_MISO/TDM_CLK2 | GPIOZ_11_d  | 1.8V       |

**Note:**

1. This Pin Can change to I2C, if DP\_AUX no needed.
2. “-od” is MOSFET OD output in chip.
3. Input H level can setting USB Boot Frist.

## 1.7 Development Kit (Idea311Y3)

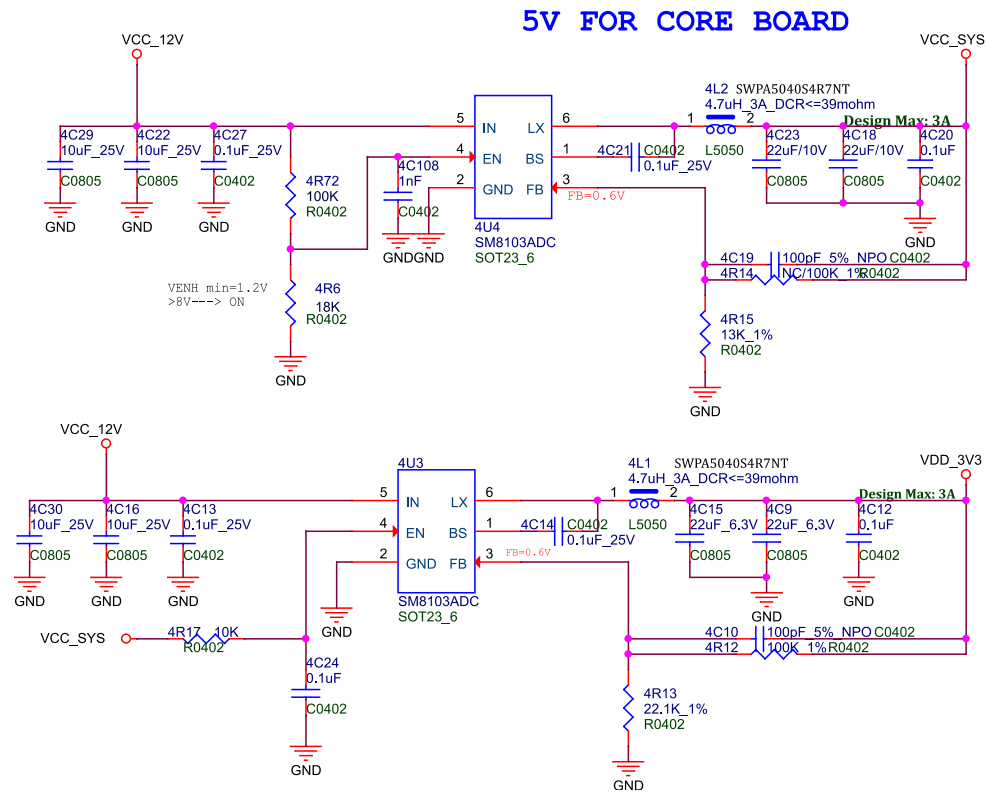




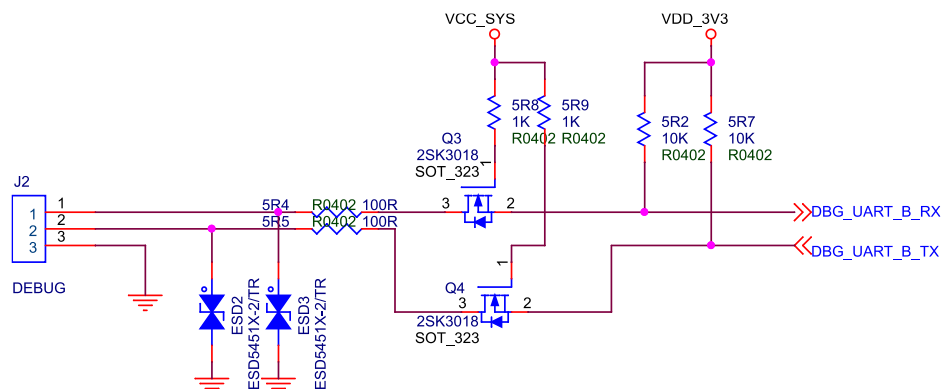
## 2 Hardware Design Guide

### 2.1 Peripheral Circuit Reference

#### 2.1.1 External Power

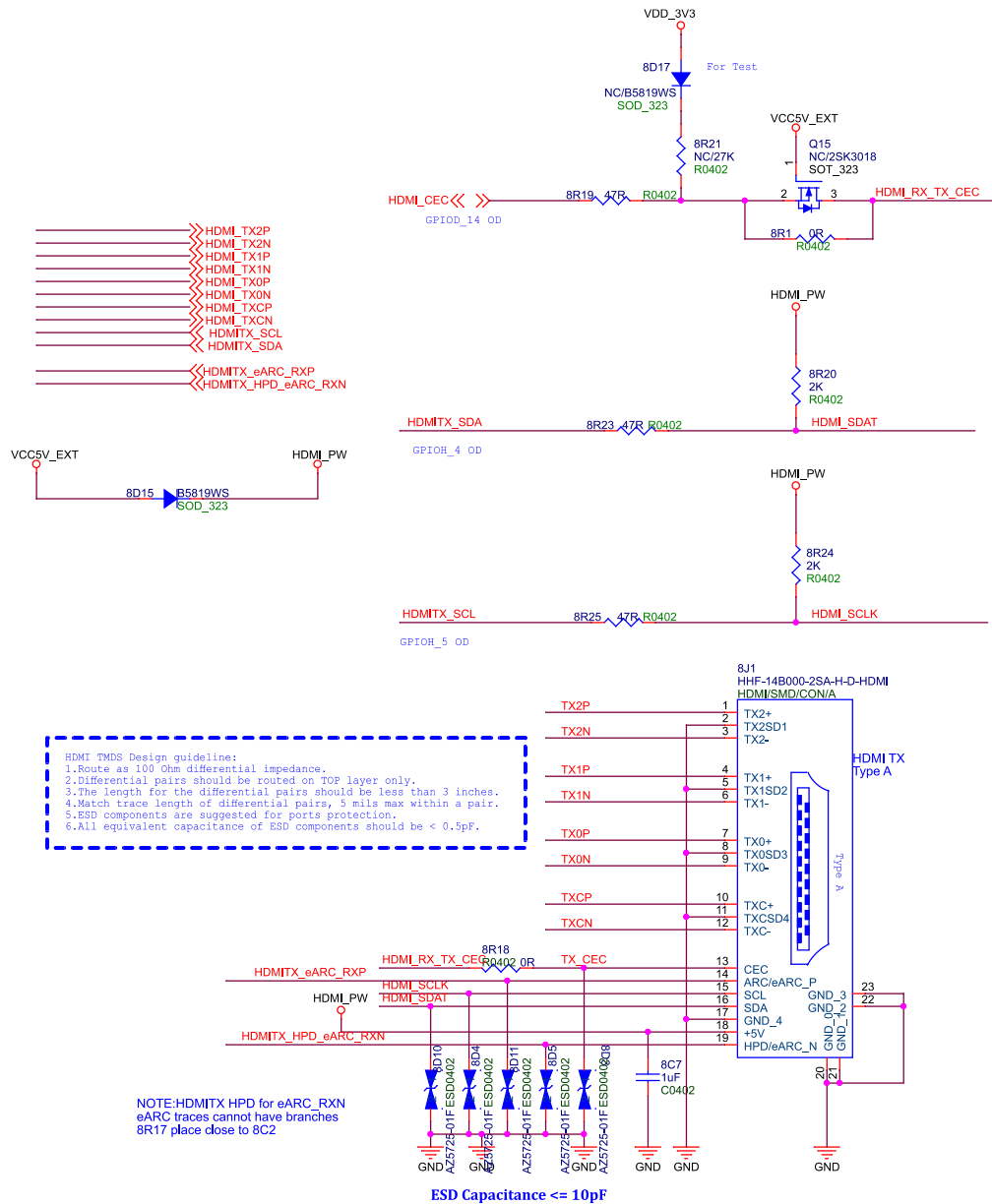


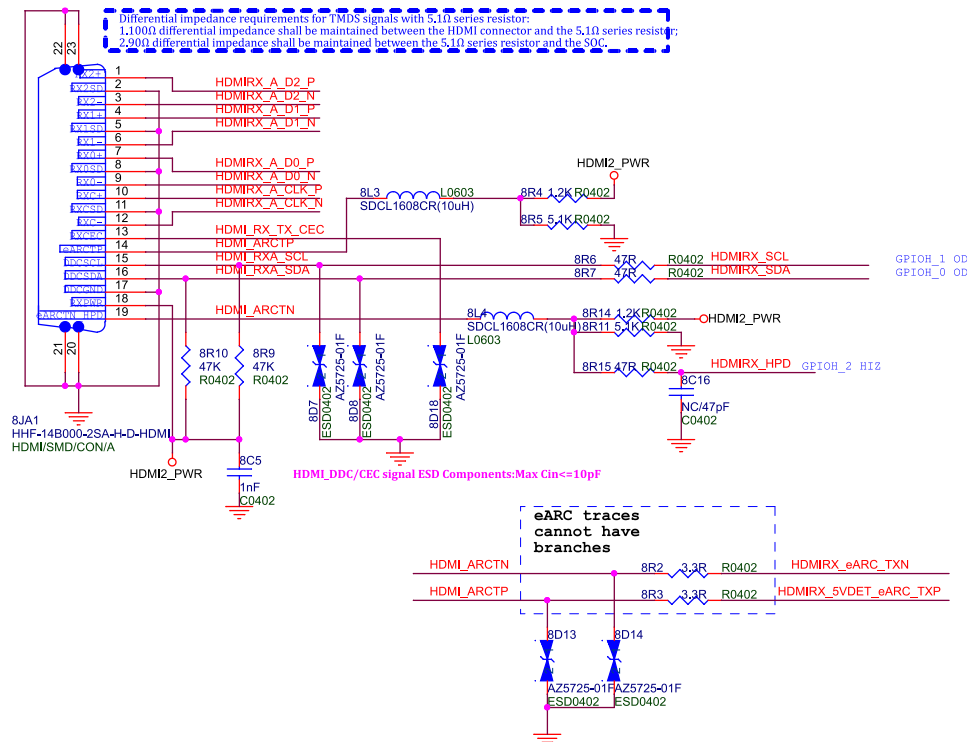
#### 2.1.2 Debug Circuit





## 2.1.3 HDMI TX Circuit



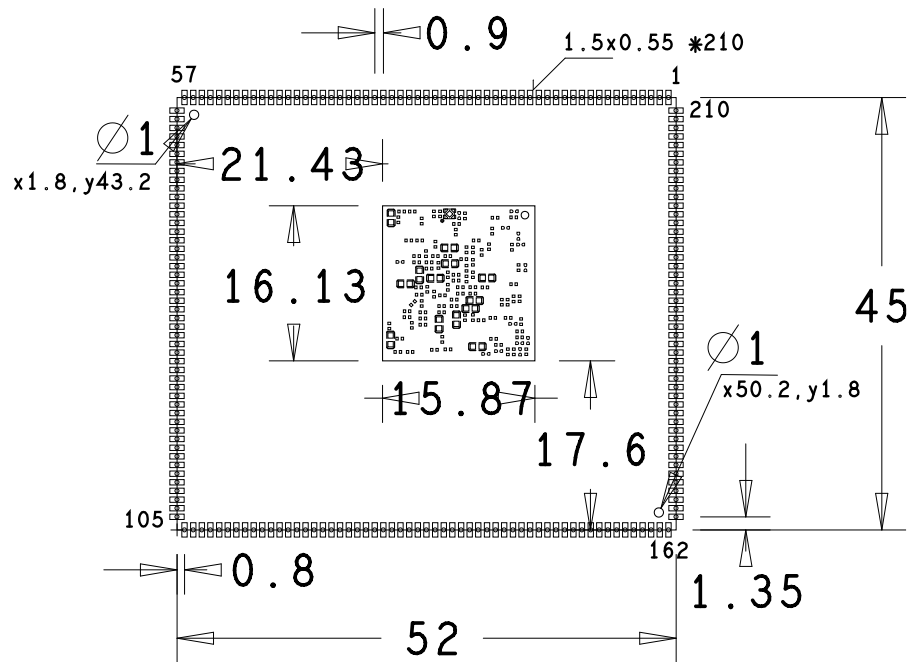


| MIPI CSI C 4-Lane Interface length offset |                   |          |       |
|-------------------------------------------|-------------------|----------|-------|
| MIPI_CSI_C_CLKP                           | MIPI_CSI0_RX0_D0P | (26.2)   | (+30) |
|                                           | MIPI_CSI0_RX0_D1P | (5.05)   |       |
|                                           | MIPI_CSI0_RX0_D2P | (9.7)    |       |
|                                           | MIPI_CSI0_RX0_D3P | (-37.18) | (-30) |

Unit: mil



## 2.3 PCB Footprint (Top View)



## 3 Product Electrical Characteristics

### 3.1 Dissipation and Temperature

| Symbol              | Parameter             | Min  | Typ  | Max | Unit |
|---------------------|-----------------------|------|------|-----|------|
| VCC_SYS             | System Voltage        | 3.4V | 5    | 5.5 | V    |
| I <sub>sys_in</sub> | VCC_SYS input Current |      | 2050 |     | mA   |
| VCC_RTC             | RTC Voltage           | 1.8  | 3    | 3.4 | V    |
| I <sub>rtc</sub>    | RTC input Current     |      | 5    | 8   | uA   |
| T <sub>a</sub>      | Operating Temperature | 0    |      | 70  | °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                          | TBD                              |          |

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

## 3.3 Certification