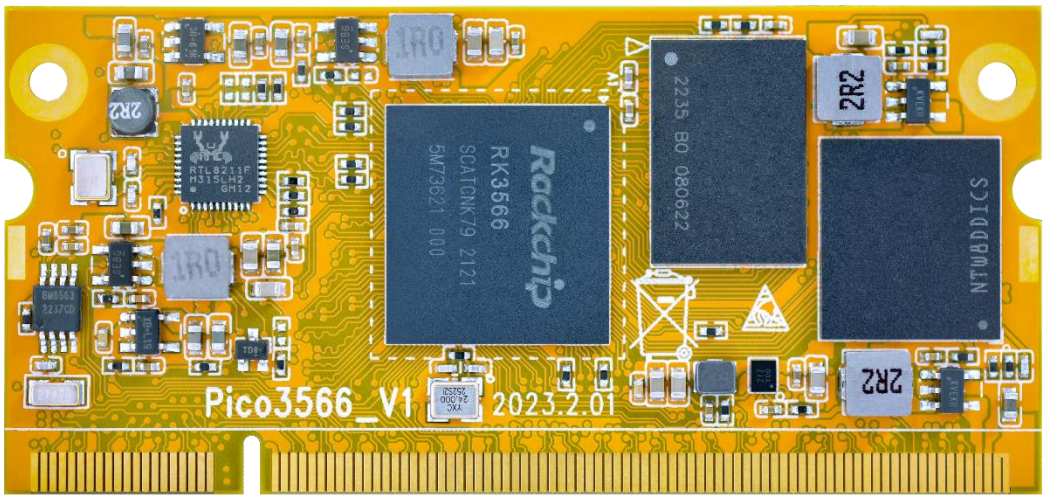
# PICO3566 Reference User Manual

V1.20230215




Boardcon Embedded Design

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 , 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.

## 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 lighting 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.

# *Content*

# 1 Pico3566 Introduction

## 1.1 Summary

The Pico3566 system-on-module is equipped with Rockchip's RK3566 it has quad-core Cortex-A55, Mali-G52 GPU, and 1 TOPs NPU.

It is designed specifically for the AI devices such as industrial controller, IoT devices, intelligent interactive devices, personal computers and robots. The high performance and low power solution can help customers to introduce new technologies more quickly and enhance the overall solution efficiency.

## 1.2 Features

- **Microprocessor**
  - Quad-core Cortex-A55 up to 1.8G
  - 32KB I-cache and 32KB D-cache for each core, 512KB L3 cache
  - 1 TOPS Neural Process Unit
  - Mali-G52 up to 0.8G

  **Memory Organization**
  - LPDDR4 or LPDDR4X RAM up to 8GB
  - EMMC up to 128GB
- **Boot ROM**
  - Supports system code download through USB OTG or SD
- **Trust Execution Environment system**
  - Supports secure OTP and multiple cipher engine
- **Video Decoder/Encoder**
  - Supports video decoding up to 4K@50fps
  - Supports H.264 encode
  - H.264 HP encoding up to 1080p@100fps
  - Picture size up t0 8192x8192
- **Display Subsystem**
  - **Video Output**

  Supports HDMI 2.0 transmitter with HDCP 1.4/2.2, up to 4K@50fps

  Supports 4 lanes MIPI DSI0 up to 2560x1440@60Hz

  Or LVDS interface up to 1920x1080@60Hz

  Supports 2 lanes MIPI DSI1 interface up to 2560x1600@60fps
  - **Image in**

  Supports MIPI CSI 4lanes interface

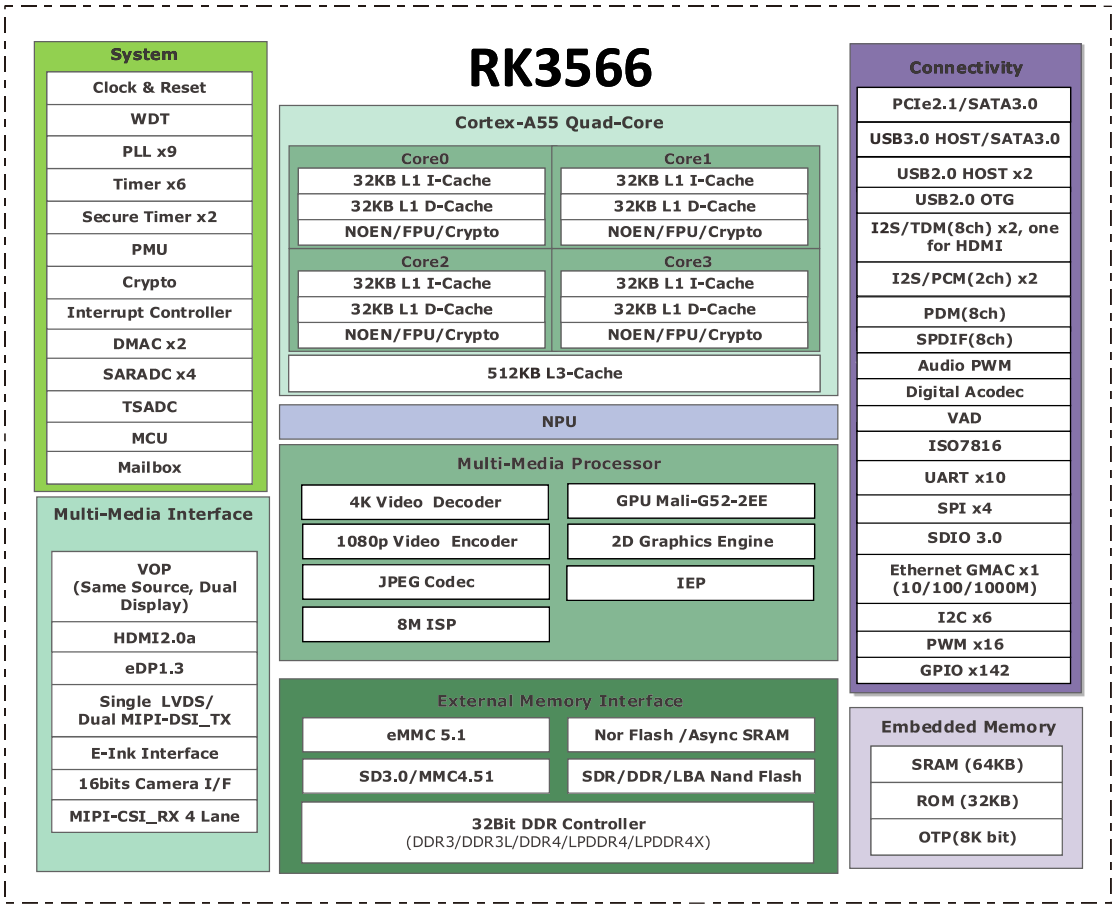
  Or 2ch MIPI CSI 2lanes interfaces
- **I2S/PCM/ AC97**

- Three I2S/PCM interface
- Support Mic array Up to 8ch PDM/TDM interface
- One SPDIF output

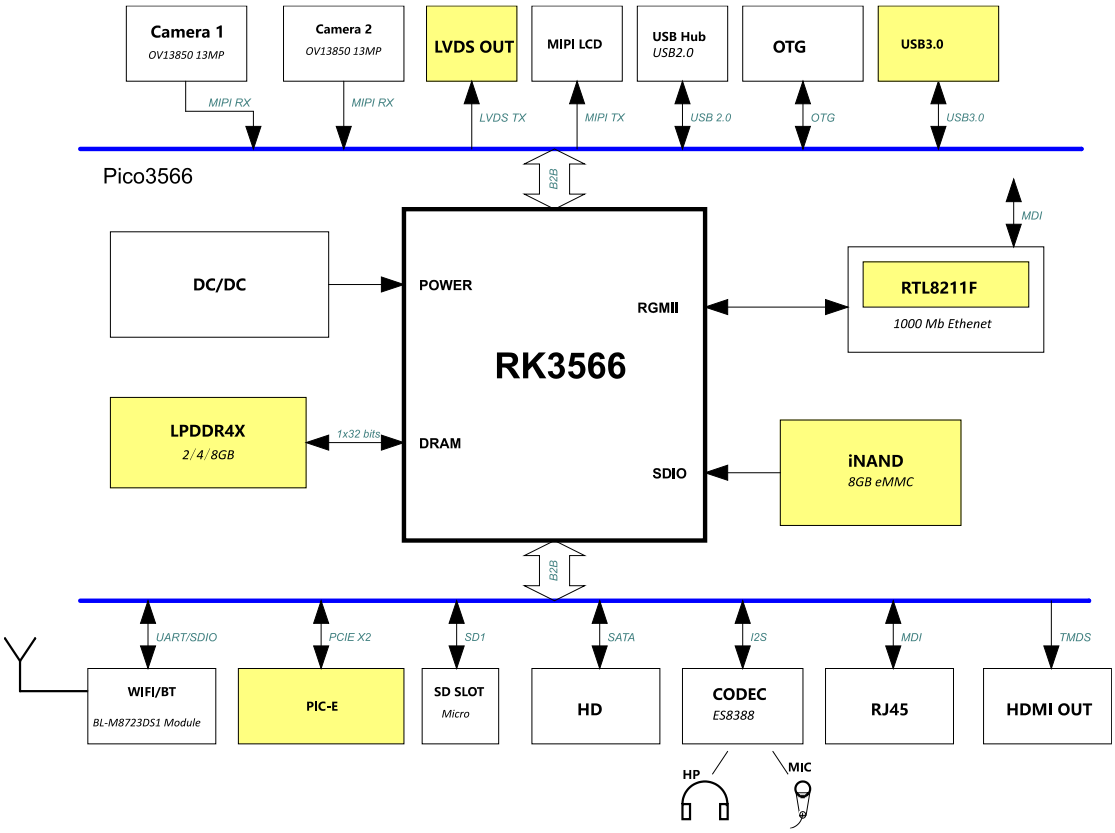
- **USB and PCIE**
  - Three 2.0 USB interfaces
  - One USB 2.0 OTG, and One USB2.0 hosts
  - One USB 3.0 host or SATA + USB2.0 interface.
  - One 1lane PCIE or SATA interface.
- **Ethernet**
  - RTL8211F on board
  - Support 10/100/1000Mbit/s data transfer rates
- **I2C**
  - Up to Four I2C
  - Support standard mode and fast mode(up to 400kbit/s)
- **SDIO**
  - Support SDIO 3.0 protocol
- **SPI**
  - Up to four SPI controllers,
  - Full-duplex synchronous serial interface
- **UART**
  - Support up to 9 UARTs
  - UART2 with 2 wires for debug tools
  - Embedded two 64byte FIFO
  - Support auto flow control mode for UART1-5
- **SATA**
  - Two SATA host controller
  - Support SATA 1.5Gb/s, 3.0Gb/s and SATA 6.0Gb/s
- **ADC**
  - One ADC channels
  - 10-bit resolution
  - Voltage input range between 0V to 1.8V
  - Support up to 1MS/s sampling rate
- **PWM**
  - 14 on-chip PWMs with interrupt-based operation
  - Support 32bit time/counter facility
  - IR option on PWM3/7/11/15
- **Power unit**
  - Discrete Power on board
  - 5V + 3.3V or Single 3.3V input
  - Very low RTC consume current, less 5uA at 3V button Cell

# 1.3 Pico3566 Block Diagram

## 1.3.1 RK3566 Block Diagram



### 1.3.2 Development board Block Diagram

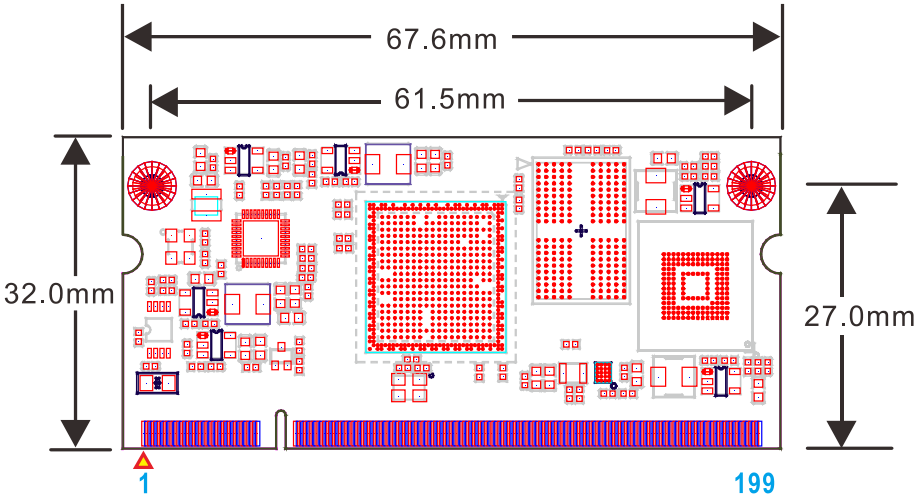



# 1.4 Pico3566 specifications

| Feature | Specifications |
|---|---|
| CPU | Quad-core Cortex-A55 |
| DDR | 2GB LPDDR4X (up to 8GB) |
| eMMC FLASH | 8GB (up to 128GB) |
| Power | DC 5V+ 3.3V |
| LVDS/MIPI DSI | 4-Lane |
| I2S | 3-CH |
| MIPI CSI | 4-Lane |
| SATA | 2-CH |
| HDMI out | 1-CH |
| Camera | 2-CH(CSI) |
| USB | 1-CH (USB HOST2.0), 1-CH(OTG 2.0) and 1-CH(USB 3.0) |
| Ethernet | 10/100/1000M MAC |
| SDMMC | 2-CH |
| SPDIF TX | 1-CH |
| I2C | 4-CH |

| | |
|---|---|
| SPI | 4-CH |
| UART | 8-CH, 1-CH(DEBUG) |
| PWM | 14-CH |
| ADC IN | 1-CH |
| Board Dimension | 32 x 67.6mm |

## 1.5 Pico3566 PCB Dimension




RPi CM3+ compatible

## 1.6 Pico3566 Pin Definition

| Pin | Signal | Description or functions | GPIO serial | IO Voltage |
|---|---|---|---|---|
| 1 | GND | Ground | | 0V |
| 2 | SDMMC0_DET_L | | GPIO0_A4_u | 3.3V |
| 3 | I2C1_SDA | Pull up 2.2K onboard | GPIO0_B4_u | 3.3V |
| 4 | USB2_HOST2_DP | HOST2_DP | | 1.8V |
| 5 | I2C1_SCL | Pull up 2.2K onboard | GPIO0_B3_u | 3.3V |
| 6 | USB2_HOST2_DM | HOST2_DM | | 1.8V |
| 7 | GND | Ground | | 0V |
| 8 | GND | Ground | | 0V |
| 9 | UART3_RX_M0 | AudioPWM_LOUT_P/ I2C3_SDA_M0 | GPIO1_A0_u | 3.3V |
| 10 | SDMMC0_CLK | UART5_TX_M0 | GPIO2_A2_d | 3.3V |
| 11 | UART3_TX_M0 | AudioPWM_LOUT_N/ I2C3_SCL_M0 | GPIO1_A1_u | 3.3V |
| 12 | SDMMC0_CMD | UART5_RX_M0 | GPIO2_A1_u | 3.3V |
| 13 | GND | Ground | | 0V |

| Pin | Signal | Description or functions | GPIO serial | IO Voltage |
|---|---|---|---|---|
| 14 | GND | Ground | | 0V |
| 15 | GPIO0_A3_u | | | 3.3V |
| 16 | SDMMC0_D0 | UART6_TX_M1 | GPIO1_D5_u | 3.3V |
| 17 | UART4_TX_M0 | AudioPWM_ROUT_P/ PDM_CLK0_M0 | GPIO1_A6_d | 3.3V |
| 18 | SDMMC0_D1 | UART6_RX_M1 | GPIO1_D6_u | 3.3V |
| 19 | GND | Ground | | 0V |
| 20 | GND | Ground | | 0V |
| 21 | UART4_RX_M0 | PDM_CLK1_M0/ SPDIF_TX_M0 | GPIO1_A4_d | 3.3V |
| 22 | SDMMC0_D2 | UART5_CTSn_M0 | GPIO1_D7_u | 3.3V |
| 23 | SPI0_CS1_M0 | PWM5 | GPIO0_C4_d | 3.3V |
| 24 | SDMMC0_D3 | UART5_RTSn_M0 | GPIO2_A0_u | 3.3V |
| 25 | GND | Ground | | 0V |
| 26 | GND | Ground | | 0V |
| 27 | SPI0_CS0_M0 | PWM7 | GPIO0_C6_d | 3.3V |
| 28 | I2S2_SCLK_TX_M0 | SPI2_MISO_M0 | GPIO2_C2_d | 3.3V /1.8V |
| 29 | SPI0_MISO_M0 | PWM6 | GPIO0_C5_d | 3.3V |
| 30 | I2S2_LRCK_TX_M0 | SPI2_MOSI_M0 | GPIO2_C3_d | 3.3V /1.8V |
| 31 | GND | Ground | | 0V |
| 32 | GND | Ground | | 0V |
| 33 | SPI0_MOSI_M0 | I2C2_SDA_M0 | GPIO0_B6_u | 3.3V |
| 34 | I2S2_SDI_M0 | UART8_TX_M0 | GPIO2_C5_d | 3.3V /1.8V |
| 35 | SPI0_CLK_M0 | I2C2_SCL_M0 | GPIO0_B5_u | 3.3V |
| 36 | I2S2_SDO_M0 | SPI2_CS0_M0 | GPIO2_C4_d | 3.3V /1.8V |
| 37 | GND | Ground | | 0V |
| 38 | GND | Ground | | 0V |
| 39 | UART2DBG_TX | UART2 for Debug | GPIO0_D1_u | 3.3V |
| 40 | UART2DBG_RX | UART2 for Debug | GPIO0_D0_u | 3.3V |
| 41 | VCCIO4 | VCCIO4 Power in | | 3.3V /1.8V |
| 42 | VCCIO4 | VCCIO4 Power in | | 3.3V /1.8V |
| 43 | GND | Ground | | 0V |
| 44 | GND | Ground | | 0V |
| 45 | PWM0_M1 | HDMITX_CEC_M1 | GPIO0_C7_d | 3.3V |
| 46 | HOST_WAKE_BT_H | I2S2_MCLK_M0 | GPIO2_C1_d | 3.3V /1.8V |
| 47 | I2S3_MCLK_M1 | SPI3_CLK_M1 | GPIO4_C2_d | 3.3V |
| 48 | WIFI_REG_ON_H | UART8_RX_M0 | GPIO2_C6_d | 3.3V /1.8V |
| 49 | GND | Ground | | 0V |
| 50 | BT_WAKE_HOST_H | I2S2_LRCLK_RX_M0 | GPIO2_C0_d | 3.3V /1.8V |
| 51 | UART5_TX_M1 | | GPIO3_C2_d | 3.3V |
| 52 | WIFI_WAKE_HOST_H | I2C4_SCL_M1 | GPIO2_B2_d | 3.3V /1.8V |
| 53 | UART5_RX_M1 | | GPIO3_C3_d | 3.3V |

| Pin | Signal | Description or functions | GPIO serial | IO Voltage |
|---|---|---|---|---|
| 54 | BT_REG_ON_H | I2S2_SCLK_RX_M0 | GPIO2_B7_d | 3.3V /1.8V |
| 55 | GND | Ground | | 0V |
| 56 | GND | Ground | | 0V |
| 57 | GPIO3_C1_d | | | 3.3V |
| 58 | UART1_TX_M0 | | GPIO2_B4_u | 3.3V /1.8V |
| 59 | GPIO1_B1_d | PDM_SDI2_M0/PCIE20_WAKEn_M2/I2S1_SDO2_M0 | | 3.3V |
| 60 | UART1_RX_M0 | | GPIO2_B3_u | 3.3V /1.8V |
| 61 | GND | Ground | | 0V |
| 62 | GND | Ground | | 0V |
| 63 | I2S3_SCLK_M1 | SPI3_MOSI_M1 | GPIO4_C3_d | 3.3V |
| 64 | UART1_RTSn_M0 | | GPIO2_B5_u | 3.3V /1.8V |
| 65 | I2S3_LRCK_M1 | SPDIF_TX_M2 | GPIO4_C4_d | 3.3V |
| 66 | UART1_CTSn_M0 | | GPIO2_B6_u | 3.3V /1.8V |
| 67 | GND | Ground | | 0V |
| 68 | GND | Ground | | 0V |
| 69 | I2S3_SDI_M1 | SPI3_CS0_M1 | GPIO4_C6_d | 3.3V |
| 70 | SDMMC1_D0 | UART6_RX_M0 | GPIO2_A3_u | 3.3V /1.8V |
| 71 | I2S3_SDO_M1 | SPI3_MISO_M1 | GPIO4_C5_d | 3.3V |
| 72 | SDMMC1_D1 | UART6_TX_M0 | GPIO2_A4_u | 3.3V /1.8V |
| 73 | GND | Ground | | 0V |
| 74 | GND | Ground | | 0V |
| 75 | GPIO0_A6_d | | | 3.3V |
| 76 | SDMMC1_D2 | UART7_RX_M0 | GPIO2_A5_u | 3.3V /1.8V |
| 77 | PWM0_M0 | | GPIO0_B7_d | 3.3V |
| 78 | SDMMC1_D3 | UART7_TX_M0 | GPIO2_A6_u | 3.3V /1.8V |
| 79 | GND | Ground | | 0V |
| 80 | GND | Ground | | 0V |
| 81 | PWM3_IR | | GPIO0_C2_d | 3.3V |
| 82 | SDMMC1_CMD | UART9_RX_M0 | GPIO2_A7_u | 3.3V /1.8V |
| 83 | GPIO0_A0_d | | | 3.3V |
| 84 | SDMMC1_CLK | UART9_TX_M0 | GPIO2_B0_d | 3.3V /1.8V |
| 85 | GND | Ground | | 0V |
| 86 | GND | Ground | | 0V |
| 87 | GPIO1_B2_d | PDM_SDI1_M0/ PCIE20_PERSTn_M2 | | 3.3V |
| 88 | HDMI_HPD_N | | | 3.3V |
| 89 | GPIO0_A5_d | PCIE20_CLKREQn_M0 | | 3.3V |
| 90 | SARADC_VIN0 | RECOVERY_KEY (pull up 10K) | | 1.8V |
| 91 | GND | Ground | | 0V |
| 92 | GND | Ground | | 0V |

| Pin | Signal | Description or functions | GPIO serial | IO Voltage |
|---|---|---|---|---|
| 93 | MIPI_DSI_TX1_D1N | | | 1.8V |
| 94 | MIPI_DSI_TX0_D0P/ LVDS_TX0_D0P | | | 1.8V |
| 95 | MIPI_DSI_TX1_D1P | | | 1.8V |
| 96 | MIPI_DSI_TX0_D0N/ LVDS_TX0_D0N | | | 1.8V |
| 97 | GND | Ground | | 0V |
| 98 | GND | Ground | | 0V |
| 99 | MIPI_DSI_TX1_D0N | | | 1.8V |
| 100 | MIPI_DSI_TX0_CLKP/ LVDS_TX0_CLKP | | | 1.8V |
| 101 | MIPI_DSI_TX1_D0P | | | 1.8V |
| 102 | MIPI_DSI_TX0_CLKN/ LVDS_TX0_CLKN | | | 1.8V |
| 103 | GND | Ground | | 0V |
| 104 | GND | Ground | | 0V |
| 105 | MIPI_DSI_TX1_CLKN | | | 1.8V |
| 106 | MIPI_DSI_TX0_D3P/ LVDS_TX0_D3P | | | 1.8V |
| 107 | MIPI_DSI_TX1_CLKP | | | 1.8V |
| 108 | MIPI_DSI_TX0_D3N/ LVDS_TX0_D3N | | | 1.8V |
| 109 | GND | Ground | | 0V |
| 110 | GND | Ground | | 0V |
| 111 | HDMI_TXCLKN | | | 1.8V |
| 112 | MIPI_DSI_TX0_D2P/ LVDS_TX0_D2P | | | 1.8V |
| 113 | HDMI_TXCLKP | | | 1.8V |
| 114 | MIPI_DSI_TX0_D2N/ LVDS_TX0_D2N | | | 1.8V |
| 115 | GND | Ground | | 0V |
| 116 | GND | Ground | | 0V |
| 117 | HDMI_TX0N | | | 1.8V |
| 118 | MIPI_DSI_TX0_D1P/ LVDS_TX0_D1P | | | 1.8V |
| 119 | HDMI_TX0P | | | 1.8V |
| 120 | MIPI_DSI_TX0_D1N/ LVDS_TX0_D1N | | | 1.8V |
| 121 | GND | Ground | | 0V |
| 122 | GND | Ground | | 0V |
| 123 | HDMI_TX1N | | | 1.8V |
| 124 | PCIE20_SATA2_TXP | | | 1.8V |

| Pin | Signal | Description or functions | GPIO serial | IO Voltage |
|---|---|---|---|---|
| 125 | HDMI_TX1P | | | 1.8V |
| 126 | PCIE20_SATA2_TXN | | | 1.8V |
| 127 | GND | Ground | | 0V |
| 128 | GND | Ground | | 0V |
| 129 | HDMI_TX2N | | | 1.8V |
| 130 | PCIE20_SATA2_RXP | | | 1.8V |
| 131 | HDMI_TX2P | | | 1.8V |
| 132 | PCIE20_SATA2_RXN | | | 1.8V |
| 133 | GND | Ground | | 0V |
| 134 | GND | Ground | | 0V |
| 135 | PCIE20_REFCLKP | | | 1.8V |
| 136 | MIPI_CSI_RX_D0P | | | 1.8V |
| 137 | PCIE20_REFCLKN | | | 1.8V |
| 138 | MIPI_CSI_RX_D0N | | | 1.8V |
| 139 | GND | Ground | | 0V |
| 140 | GND | Ground | | 0V |
| 141 | USB3_HOST1_DP | | | 1.8V |
| 142 | MIPI_CSI_RX_CLK0P | | | 1.8V |
| 143 | USB3_HOST1_DM | | | 1.8V |
| 144 | MIPI_CSI_RX_CLK0N | | | 1.8V |
| 145 | GND | Ground | | 0V |
| 146 | GND | Ground | | 0V |
| 147 | MIPI_CSI_RX_CLK1P | | | 1.8V |
| 148 | MIPI_CSI_RX_D1P | | | 1.8V |
| 149 | MIPI_CSI_RX_CLK1N | | | 1.8V |
| 150 | MIPI_CSI_RX_D1N | | | 1.8V |
| 151 | GND | Ground | | 0V |
| 152 | GND | Ground | | 0V |
| 153 | MIPI_CSI_RX_D3P | | | 1.8V |
| 154 | USB3_HOST1_SSTXP | | | 1.8V |
| 155 | MIPI_CSI_RX_D3N | | | 1.8V |
| 156 | USB3_HOST1_SSTXN | | | 1.8V |
| 157 | GND | Ground | | 0V |
| 158 | GND | Ground | | 0V |
| 159 | MIPI_CSI_RX_D2P | | | 1.8V |
| 160 | USB3_HOST1_SSRXP | | | 1.8V |
| 161 | MIPI_CSI_RX_D2N | | | 1.8V |
| 162 | USB3_HOST1_SSRXN | | | 1.8V |
| 163 | GND | Ground | | 0V |
| 164 | GND | Ground | | 0V |
| 165 | USB_OTG0_DP | | | 1.8V |
| 166 | PCIE20_CLKREQn_M2 | PDM_SDI3_M0 | GPIO1_B0_d | 3.3V |

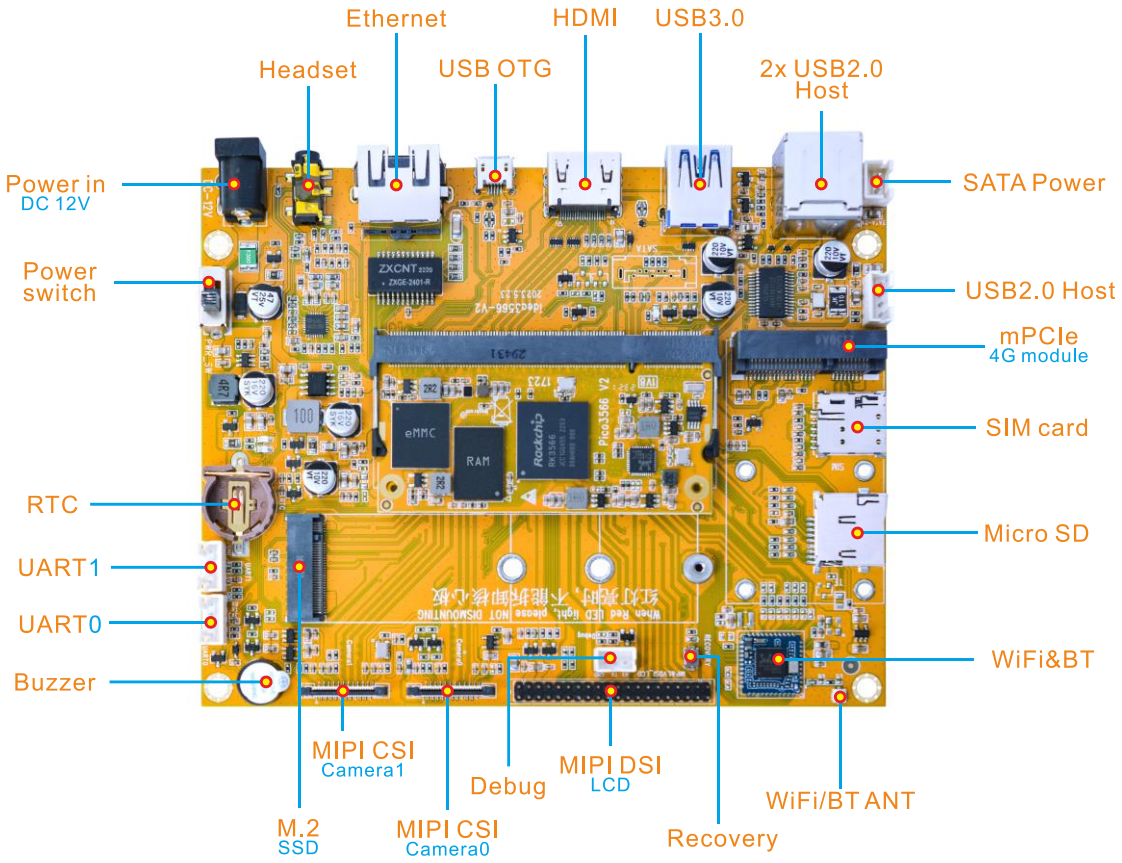
| Pin | Signal | Description or functions | GPIO serial | IO Voltage |
|---|---|---|---|---|
| 167 | USB_OTG0_DM | | | 1.8V |
| 168 | USB_OTG0_ID | | | 1.8V |
| 169 | GND | Ground | | 0V |
| 170 | LCD_BL_PWM | PWM4 | GPIO0_C3_d | 3.3V |
| 171 | HDMITX_CEC | | GPIO4_D1_u | 3.3V |
| 172 | I2S1_SCLK_TX_M0 | UART3_CTSn_M0 | GPIO1_A3_d | 3.3V |
| 173 | HDMITX_SDA | Pull up 2.2K onboard | GPIO4_D0_u | 3.3V |
| 174 | I2S1_LRCK_TX_M0 | | GPIO1_A5_d | 3.3V |
| 175 | HDMITX_SCL | Pull up 2.2K onboard | GPIO4_C7_u | 3.3V |
| 176 | I2S1_SDI0_M0 | PDM_SDI0_M0 | GPIO1_B3_d | 3.3V |
| 177 | LED1/CFG_LDO0 | | | 3.3V |
| 178 | I2S1_SDO0_M0 | AudioPWM_ROUT_N/ UART4_CTSn_M0 | GPIO1_A7_d | 3.3V |
| 179 | LED2/CFG_LDO1 | | | 3.3V |
| 180 | I2S1_MCLK_M0 | UART3_RTSn_M0 | GPIO1_A2_d | 3.3V |
| 181 | MDI0+ | | | 0V |
| 182 | MDI2+ | | | 1.8V |
| 183 | MDI0- | | | 1.8V |
| 184 | MDI2- | | | 1.8V |
| 185 | MDI1+ | | | 1.8V |
| 186 | MDI3+ | | | 1.8V |
| 187 | MDI1- | | | 1.8V |
| 188 | MDI3- | | | 1.8V |
| 189 | VCC_RTC | | | 3.3V |
| 190 | RTC_32KOUT | 32.768kHz output (PU 10K) | | 3.3V |
| 191 | USB_OTG0_VBUSDET | USB OTG VBUS input | | 3.3V |
| 192 | VCC3V3_SYS | | | 3.3V |
| 193 | VCC3V3_SYS | | | 3.3V |
| 194 | VCC3V3_SYS | | | 3.3V |
| 195 | GND | Ground | | 0V |
| 196 | GND | Ground | | 0V |
| 197 | VCC5V_SYS | | | **5V/3.3V** |
| 198 | VCC5V_SYS | | | **5V/3.3V** |
| 199 | VCC5V_SYS | | | **5V/3.3V** |
| 200 | VCC5V_SYS | | | **5V/3.3V** |

***Note:***

*The Pins filled red is different as RPi CM3+.*

*The Green word GPIOs is powered by VCCIO4(Pin41-42).*

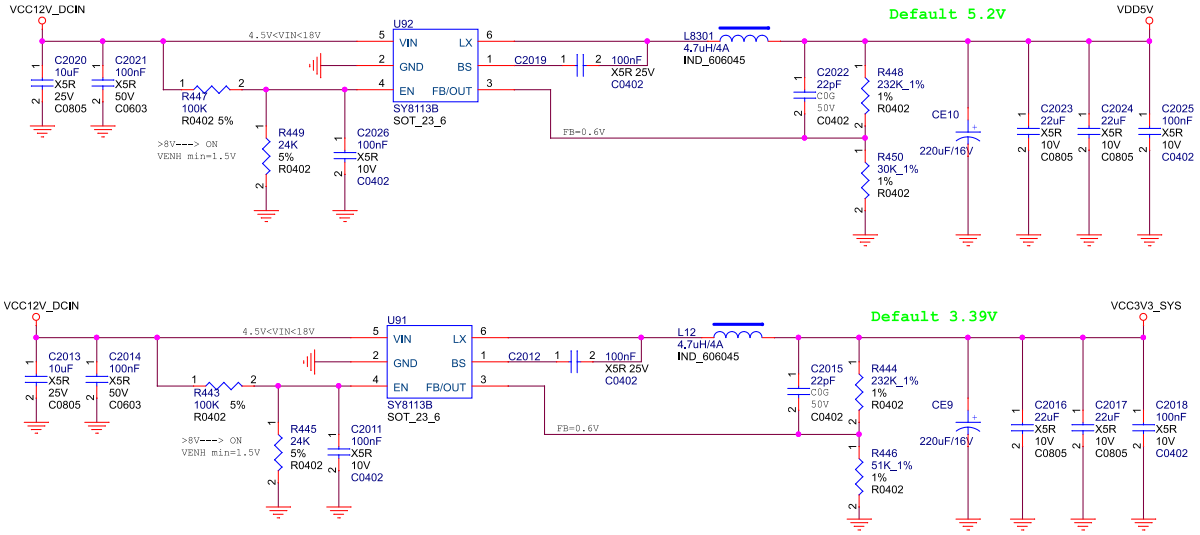
# 1.7 Development Kit (SBC3566)



# 2 Hardware Design Guide

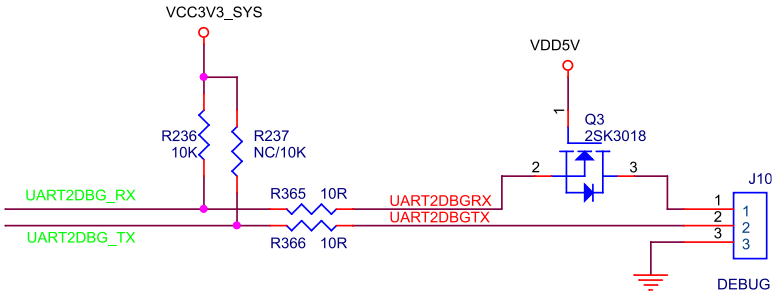
## 2.1 Peripheral Circuit Reference

### 2.1.1 External Power

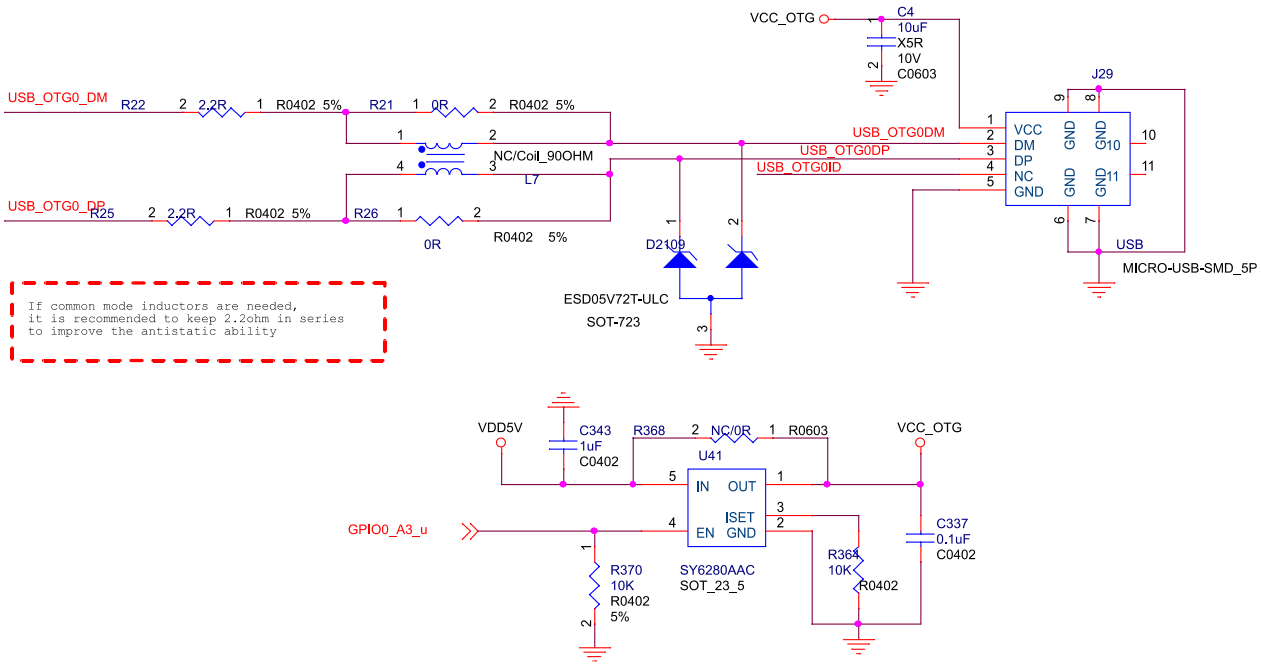



Vout=0.6*(1+R444/R446)

### 2.1.2 Debug Circuit



### 2.1.3 USB OTG Interface Circuit




## 2.3 Motherboard Connector

Adopt standard DDR2 SODIMM connector.

DIMM200 1.8V connector

# 3 Product Electrical Characteristics

## 3.1 Dissipation and Temperature

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| VCC5V_SYS | System IO Voltage | 3.2 | 5 | 5.5 | V |
| Isys5_in | VCC5V_SYS input Current | | TDB | | mA |
| VCC3V3_SYS | System IO Voltage | 3.3-5% | 3.3 | 3.3+5% | V |
| Isys33_in | VCC3V3_SYS input Current | | TDB | | mA |
| VCC_RTC | RTC Voltage | 1.8 | 3 | 3.4 | V |
| Iirtc | RTC input Current | | 5 | 8 | uA |
| Ta | Operating Temperature | -0 | | 70 | °C |
| Tstg | Storage Temperature | -40 | | 85 | °C |