MINI3576 Reference User Manual

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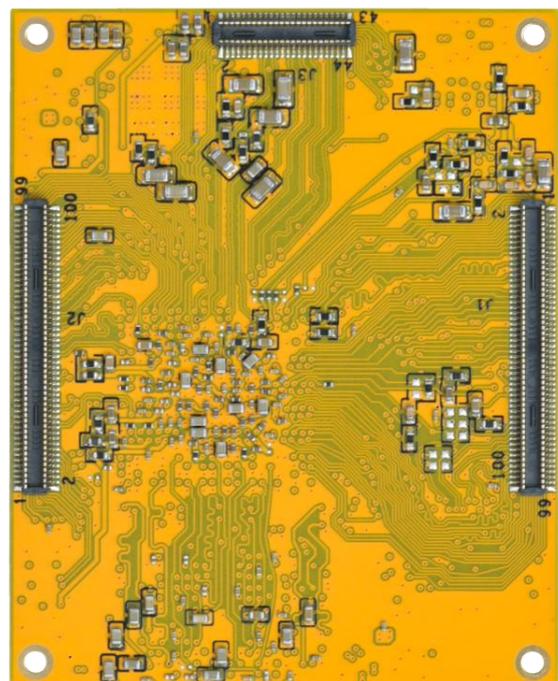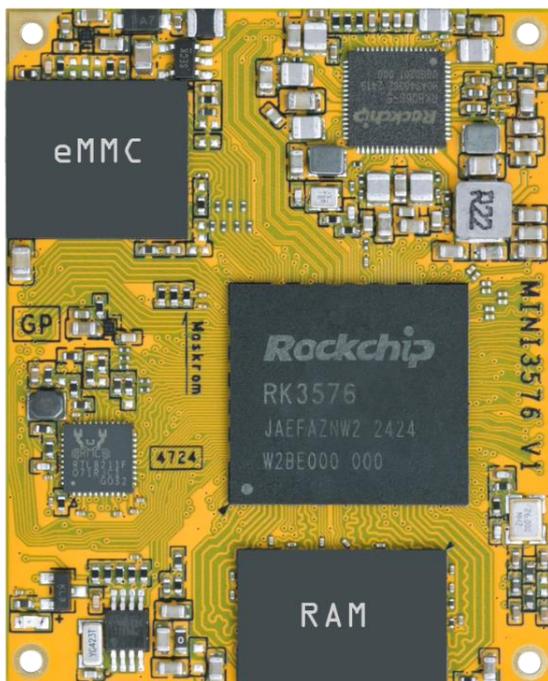
1. Introduction

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.

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1 MINI3576 Introduction

1.1 Summary

The Mini3576 system-on-module is equipped with Rockchip's RK3576, which features quad-core Cortex-A72 and quad-core Cortex-A53, embedded Mali-G52 MC3 GPU and 6.0 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**
  - Quad-core Cortex-A72 up to 2.2GHz
  - Quad-core Cortex-A53 up to 1.8GHz
  - 48KB I-cache 32KB D-cache and 1MB L2 for A72 each core, 32KB I-cache 32KB D-cache and 512KB L2 for A53 each core
  - 6.0 TOPS Neural Process Unit
  - Mali-G52 MC3 up to 1.0GHz
  - Single-core Cortex-M0 for user application
- **Memory Organization**
  - LPDDR4 or LPDDR4X RAM up to 8GB
  - eMMC up to 256GB, or UFS up to 512GB
  - Support FSPI Flash
- **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**
  - H.265/VP9/AVS2/AV1 decoding up to 8K@30fps or 4K@120fps
  - H.264/AVC decoding up to 4K@30fps
  - H.264/H.265 encoding up to 4K@60fps
  - Picture size up to 65520 x 65520

Display Subsystem
  - **Video Output**
    - Supports HDMI 2.1 TX with ARC, up to 4K@60fps or EDP TX interface up to 4K@60Hz HDMI 2.1 support FRL mode

- Supports 4 lanes MIPI DSI up to 4K@60Hz

- Supports PD1.4a interface up to 4K@60fps

- Supports RGB 24bit output

- Supports E-ink screen interface

- **Video/Image Input**

- Supports 3-CH MIPI 4lanes CSI interfaces

  or 4-CH MIPI 2lanes + 1-CH 4lanes CSI interfaces

- Supports DVP 16-bit input

- **Audio**
  - Five I2S/PCM interfaces
  - Support 8-ch TX/RX on I2S0/1
  - Support Mic array Up to 8ch PDM/TDM interface
  - Support 2-ch SPDIF output
  - Support 2-ch SPDIF input
  - Support voice activity detection

- **USB / PCIE/SATA3**
  - One Type-C or DP interfaces
  - Support 2-CH USB3.0 Host interfaces
  - Support 1-CH USB2.0 OTG interfaces
  - One PCIE2.1x1 or SATA3 interface.
  - Support 2-CH PCIE2.1x1 or SATA3 when HOST1 no used.
  - SATA3 support five device each port via PM switch

- **Ethernet**
  - PHY chip RTL8211F on board
  - Support 2-CH Gigabit Ethernet

- **I2C**
  - Up to 9-CH I2C
  - Support standard mode and fast mode(up to 400kbit/s)

- **I3C**
  - Up to 2-CH I3C
  - Support HDR mode(up to 30Mbps)
  - I2C compatible

- **SDIO / SDMMC**
  - Support SDIO 3.0 protocol
  - Support SD3.0 card

- **SPI**
  - Up to 5-ch SPI controllers
  - Full-duplex synchronous serial interface

- **UART**
  - Support up to 12 UARTs
  - UART2 with 2 wires for debug
  - Embedded two 64byte FIFO

- **CAN**
  - Support up to two CAN controller

- Support CAN FD 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 4 PWMs with interrupt-based operation
  - Support 32bit time/counter facility

- **Power unit**
  - PMU RK806 on board
  - 3.4 ~ 5.5V main power input
  - 1.8V and 3.3V max 500mA output
  - Very low RTC consume current, less 5uA at 3V button Cell.

1.3 Mini3576 Block Diagram

1.3.1 RK3576 Block Diagram
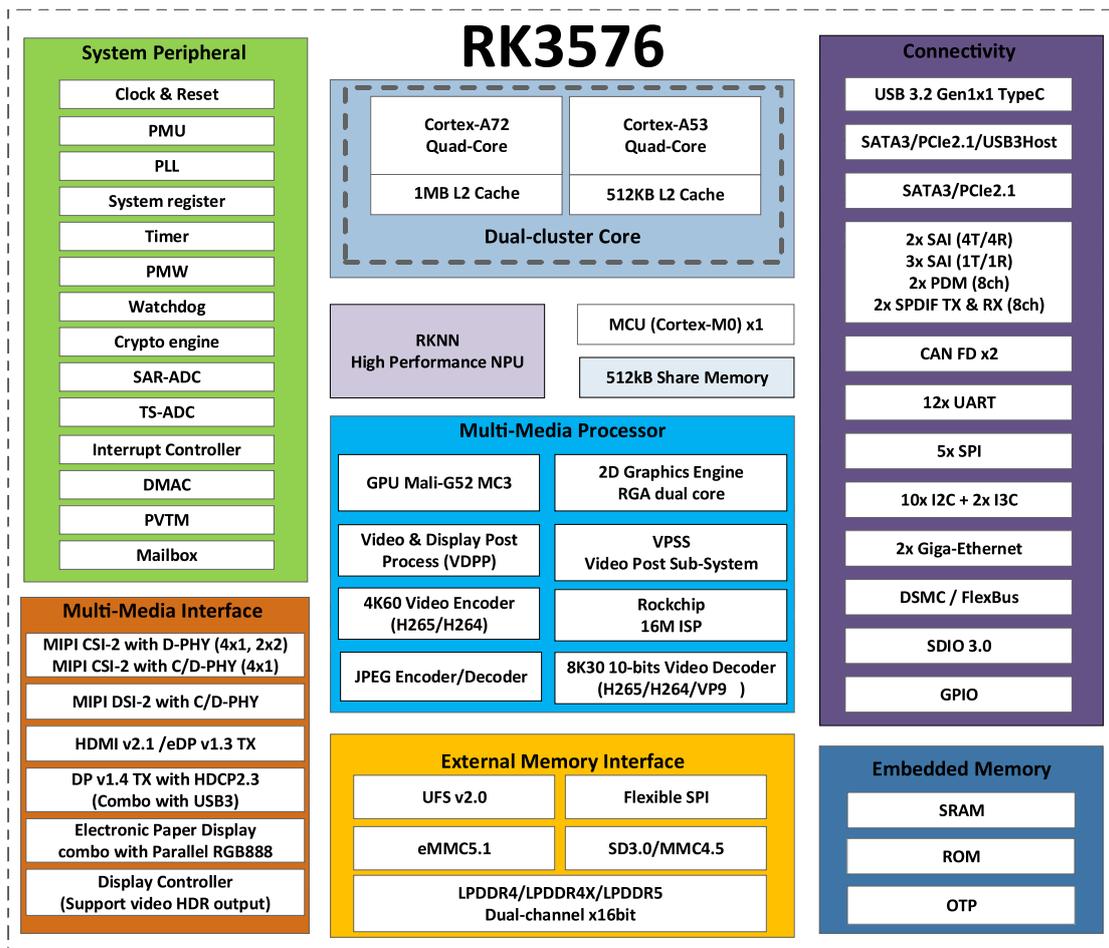
1.3.2 Development board (SBC3576) Block Diagram

| CAM0 | CAM1 | CAM2 | CAN | RS485 | MINI DP | WIFI6/BT-PCIe UART_2T2R | ETHERNET0 | ETHERNET1 |

MIPI CSI 4Lane | MIPI CSI 2Lane | MIPI CSI 2Lane | CAN | UART | DP | PCIE | MDI | MDI

B2B

RK806-5 → POWER

RGMII1 → RTL8211F 1000 Mb Ethenet

RK3576

HYM8563TS RTC IC

UFS

SDIO ← FLASH

LPDDR4X → 32 bits → DRAM

B2B

MINI3576

I2S/PCM | PCIE | SD1 | USB | LCD TX | MIPI | TMDS

| Audio ES8388 | M.2 +4G | SD SLOT Micro | USB3.0 | MIPI LCD | HDMI INPUT | HDMI OUT |

HP | MIC

1.4 Mini3576 specifications

Feature	Specifications
CPU	Quad-core Cortex-A72 and quad-core Cortex-A53
DDR	4GB LPDDR4/x (up to 8GB)
eMMC FLASH	32GB (up to 256GB)
UFS FLASH (option)	up to 512GB
Power	DC 3.4 ~ 5.5V
EDP/MIPI DSI	1-CH EDP, 1-CH MIPI DSI
I2S	5-CH
MIPI CSI	3-CH 4-Lane or 4-CH 2-Lane + 1-CH 4-Lan CSI (up to 5 CSI Cameras)
DVP	1-CH 16bit
HDMI output	1-CH (EDP option)
DP output	1-CH

Feature	Specifications
RGB output	1-CH 24bit
EBC output	1-CH (option)
Flex Bus	(option)
CAN	2-CH
USB	1-CH Type C and 1-CH USB Host3.0
PCIe/SATA	2-CH
Ethernet	2-CH (1 GB PHY and 1-CH RGMII)
SDMMC	2-CH
SPDIF TX	2-CH
SPDIF RX	2-CH
I2C	9-CH
I3C	2-CH
SPI	5-CH
UART	11-CH, 1-CH(DEBUG)
PWM	4-CH
ADC IN	2-CH
Board Dimension	50 x 40mm

1.5 Mini3576 PCB Dimension
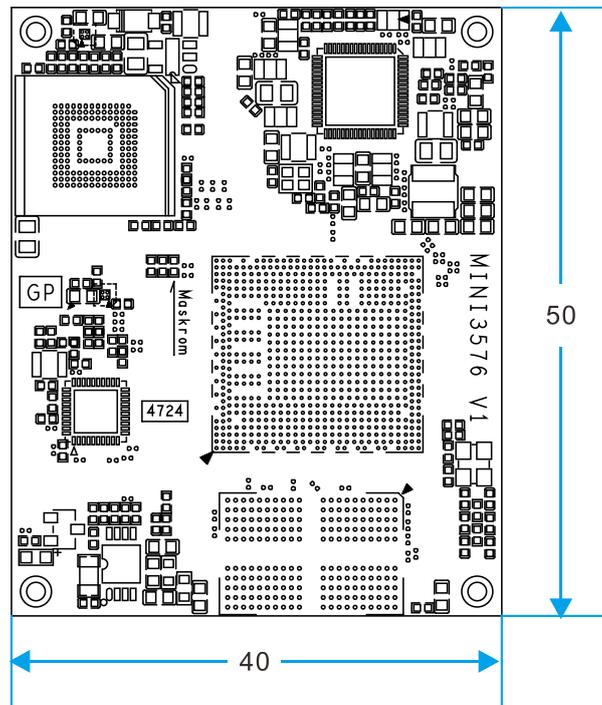
1.6 Mini3576 Pin Definition

J1	Signal	Description or functions	GPIO serial	IO Voltage
1	VCC_SYS	System Power Input		3.4V-5.5V
2	SPDIF_RX1_M2_1V8	I2C5_SCL_M1/UART10RTSn_M1/PDM0_SDI3_M2/SAI2_MCLK_M0/FSPI1_DQS_M1	GPIO1_D4_d	1.8V
3	VCC_SYS	System Power Input		3.4V-5.5V
4	UART4_CTSN_M1_1V8	SPI2_CSn0_M1/I2C6_SDA_M1/FSPI1_CSN0_M1	GPIO1_C3_u	1.8V
5	VCC_SYS	System Power Input		3.4V-5.5V
6	UART4_RTSN_M1_1V8	SPI2_CSn1_M1/I2C6_SCL_M1/FSPI1_CSN1_M1/PWM1_CH2_M1	GPIO1_C2_u	1.8V
7	VCC_SYS	System Power Input		3.4V-5.5V
8	SAI2_LRCK_M0_1V8	SAI2_LRCK_M0/I3C0_SCL_M1/FSPI1_D6_M1/PWM1_CH3_M1	GPIO1_D2_d	1.8V
9	VCC_SYS	System Power Input		3.4V-5.5V
10	UART4_TX_M1_1V8	SPI2_MOSI_M1/UART2_RTSN_M0/FSPI1_D0_M1	GPIO1_C4_d	1.8V
11	VCC_SYS	System Power Input		3.4V-5.5V
12	UART4_RX_M1_1V8	SPI2_MISO_M1/UART2_CTSN_M0/FSPI1_D1_M1	GPIO1_C5_d	1.8V
13	HOST_WAKE_BT_H_1V8	SPI2_CLK_M1/I2C5_SDA_M1/UART10_CTS_M1/PDM0_CL1_M2/FSPI1_CLK_M1/SPDIF_TX1	GPIO1_D5_d	1.8V
14	BT_REG_ON_H_1V8	I2C8_SDA_M1/UART2_RX_M0/PDM0_SDI1_M2/FSPI1_D3_M1/SATA_CPDET	GPIO1_C7_d	1.8V
15	SAI2_SCLK_M0_1V8	UART10_RX_M1/I3C0_SDA_PU_M1/SAI2_SCLK_M0/FSPI1_D5_M1	GPIO1_D1_d	1.8V
16	SDMMC1_CLK_M0_1V8	UART3_RX_M2/PDM0_CLK0_M2/SAI3_MCLK_M1	GPIO1_C1_d	1.8V
17	SAI2_SDO_M0_1V8	UART10_TX_M1/FSPI1_D4_M1	GPIO1_D0_d	1.8V
18	GND	Ground		0V
19	SAI2_SDI_M0_1V8	I3C0_SDA_M1/FSPI1_D7_M1/PWM1_CH4_M1	GPIO1_D3_d	1.8V

J1	Signal	Description or functions	GPIO serial	IO Voltage
20	SDMMC0_CLK	I3C1_SDA_PU_M1/SPI0_CLK_M1/I2C5_SCL_M0/UART5_TX_M2/SAI3_SCLK_M0/FSPI1_CLK_M0/PWM1_CH4_M1	GPIO2_A5_d	1.8V
21	WIFI_REG_ON_H_1V8	I2C8_SCL_M1/UART2_TX_M0/PDM0_SDI0_M2/FSPI1_D2_M1/SATA_CPPOD	GPIO1_C6_d	1.8V
22	GND	Ground		0V
23	SDMMC0_DET_L_1V8		GPIO0_A7_u	1.8V
24	SARADC_VIN2	ADC_IN2		1.8V
25	GND	Ground		0V
26	RECOVERY_SARADC_VIN1	RECOVERY MODE/ADC_IN1(PU10K)		1.8V
27	SDMMC1_D1_M0_1V8	I2C9_SCL_M1/SPI1_MOSI_M0/PCIE1_WAKE_M1/SAI3_LRCK_M1/PWM1_CH1_M1	GPIO1_B5_d	1.8V
28	GND	Ground		0V
29	SDMMC1_D0_M0_1V8	I2C9_SDA_M1/SPI1_CLK_M0/PCIE1_CLKREQ_M1/SAI3_SCLK_M1/PWM1_CH0_M1	GPIO1_B4_d	1.8V
30	SAI0_MCLK_M0/E0_RCK_M1_1V8	SPI4_MISO_M3/UART7_RTSN_M0/PDM0_CLK0_M3/SDMMC1_DETN_M1/VI_CIF_D8/SATA1_ACTLED_M0	GPIO2_B5_d	1.8V
31	SDMMC1_D2_M0_1V8	UART3_CTSN_M2/SPI1_MISO_M0/PCIE0_CLKREQ_M1/SAI3_SDO_M1	GPIO1_B6_d	1.8V
32	SPDIF_RX1_M1/E0_RCT_M1_1V8	MIPI_TE_M1/CAN1_TX_M3/SPI3_MISO_M0/UART3_CTSN_M0/SAI3_SDO_M2/VI_CIF_CLKO	GPIO3_A2_d	1.8V
33	SDMMC1_D3_M0_1V8	UART3_RTSN_M2/SPI1_CS0_M0/PCIE0_WAKE_M1/SAI3_SDI_M1	GPIO1_B7_d	1.8V
34	SAI0_SDO0_M0/E0_RD0_M1_1V8	I2C4_SCL_M2/UART8_TX_M1/SPI4_CS1N_M3/SDMMC1_D0_M1/VI_CIF_D15	GPIO2_A6_d	1.8V
35	SDMMC1_CMD_M0_1V8	UART3_TX_M2/SPI1_CS1_M0/PDM0_SDI2_M2/PWM0_CH0_M1	GPIO1_C0_d	1.8V

J1	Signal	Description or functions	GPIO serial	IO Voltage
36	CSI0_PWREN/E0_RD1_M1_1V8	SPDIF_TX1_M1/CAN1_RX_M3/SPI3_CS0_M0/UART3_RTSN_M0/SAI3_SDI_M2/VI_CIF_CLKI	GPIO3_A3_d	1.8V
37	GND	Ground		0V
38	SAI0_LRCK_M0/E0_RD2_M1_1V8	I2C8_SDA_M2/UART8_CTS_M0/UART7_RX_M0/VI_CIF_D6	GPIO2_B7_d	1.8V
39	SDMMC0_D1	DSM_ALN_M0/I2C8_SDA_M0/UART0_TX_M1/UART7_TX_M2/SPI0_MISO_M1/CAN0_TX_M0/SAI3_MCLK_M3	GPIO2_A1_d/ PWM2_CH3_M0/ FSPI1_D1_M0	3.3V
40	SAI0_SCLK_M0/E0_RD3_M1_1V8	I2C8_SCL_M2/UART8_RTS_M0/UART7_TX_M0/VI_CIF_D7	GPIO2_B6_d	1.8V
41	SDMMC0_D0	DSM_ALP_M0/I2C8_SCL_M0/UART0_RX_M1/UART7_RX_M2/SPI0_MOSI_M1/CAN0_RX_M0	GPIO2_A0_d/ PWM2_CH2_M0/ FSPI1_D0_M0	3.3V
42	GND	Ground		0V
43	SDMMC0_CMD	I2C5_SDA_M0/UART5_RX_M2/SPI0_CSN0_M1/SAI3_SDO_M3	GPIO2_A4_d/ PWM2_CH4_M0/ FSPI1_CSN0_M0	3.3V
44	SAI0_SDO2_M0/E0_TCK_M1_1V8	SPI4_CLK_M3/UART1_RTSN_M1/PDM0_CLK1_M3/SDMMC1_CLK_M1/VI_CIF_D10/PCIE1_CLKREQ_M0	GPIO2_B3_d	1.8V
45	SDMMC0_D3	I3C1_SDA_M1/DSM_ARN_M0/UART5_CTSN_M2/SAI3_SDI_M3/CAN1_TX_M0	GPIO2_A3_d/ FSPI1_D3_M0/ JTAG_TMS_M0	3.3V
46	SAI0_SDO1_M0/E0_TCT_M1_1V8	I2C4_SDA_M2/UART8_RX_M1/SDMMC1_D1_M1/VI_CIF_D14	GPIO2_A7_d	1.8V
47	SDMMC0_D2	I3C1_SCL_M1/DSM_ARP_M0/UART5_RTSN_M2/SAI3_LRCK_M3/CAN1_RX_M0	GPIO2_A2_d/ FSPI1_D2_M0/ JTAG_TCK_M0	3.3V
48	SAI0_SDI1_M0/E0_TD0_M1_1V8	UART1_RX_M1/PDM0_SDI2_M3/SDMMC1_D3_M1/VI_CIF_D12	GPIO2_B1_d	1.8V
49	GND	Ground		0V

J1	Signal	Description or functions	GPIO serial	IO Voltage
50	SAI0_SDI0_M0/E0_TD1_M1_1V8	UART1_TX_M1/PDM0_SDI3_M3/SDMMC1_D2_M1/VI_CIF_D13	GPIO2_B0_d	1.8V
51	32KOUT_RTC_1V8	RTC_CLKO(PU10K)/I2C6_SCL_M0	GPIO0_A2(Note1)	1.8V
52	SAI0_SDI3_M0/E0_TD2_M1_1V8	SPI4_MOSI_M3/UART7_CTSN_M1/PDM0_SDI0_M3/SDMMC1_CLK_M1/VI_CIF_D9/SATA0_ACTLED_M0	GPIO2_B4_d	1.8V
53	VCC_RTC	RTC Power input		1.8~3.3V
54	SAI0_SDI2_M0/E0_TD3_M1_1V8	SPI4_CS0_M3/UART1_CTSN_M1/PDM0_SDI1_M3/SDMMC1_CMD_M1/VI_CIF_D11/PCIE0_CLKREQ_M0	GPIO2_B2_d	1.8V
55	LCDC_D15/EBC_SDDO15/DSMC_DATA9	UART9_RTS_M1/ETH0_TXD1_M0/SPDIF_RX1_M0/FLEXBUS0_D1	GPIO3_B4_d/ PWM1_CH4_M3	3.3V
56	GND	Ground		0V
57	LCDC_D14/EBC_SDDO14/DSMC_DATA8	UART9_CTS_M1/ETH0_TXD0_M0/SPDIF_TX1_M0/FLEXBUS0_D0	GPIO3_B5_d/ PWM1_CH5_M3	3.3V
58	LCDC_D16/EBC_SDCE0/DSMC_DATA10	I2C8_SCL_M3/UART9_TX_M1/ETH0_TXCTL_M0/PDM1_SDI0_M2/FLEXBUS0_D2	GPIO3_B3_d	3.3V
59	LCDC_D13/EBC_SDDO13/DSMC_DQS1	SPI3_CSN0_M1/ETH0_TXCLK_M0/FLEXBUS0_CLK	GPIO3_B6_d/ PWM0_CH1_M3	3.3V
60	LCDC_D17/EBC_SDCE1/DSMC_DATA11	I2C8_SDA_M3/UART9_RX_M1/ETH0_RXD0_M0/PDM1_SDI1_M2/FLEXBUS0_D3	GPIO3_B2_d	3.3V
61	LCDC_D12/EBC_SDDO12/DSMC_DQS0	I2C4_SDA_M3/UART2_RX_M2/UART3_CTS_M1/SAI1_SDO0_M1/FLEXBUS1_D10/FLEXBUS1_CSN_M0	GPIO3_B7_d	3.3V
62	LCDC_D18/EBC_SDCE2/DSMC_DATA12	UART10_TX_M0/SPI4_CSN0_M1/ETH0_RXD1_M0/PDM1_CLK0_M2/FLEXBUS0_D4	GPIO3_B1_d/ PWM1_CH3_M3	3.3V
63	LCDC_D11/EBC_SDDO11/DSMC_DATA7	I2C4_SCL_M3/UART2_TX_M2/UART3_RTS_M1/SAI1_SDO3_M1/FLEXBUS1_D9	GPIO3_C0_d	3.3V
64	LCDC_D19/EBC_SDCE3/DSMC_CSN1	UART10_RX_M0/SPI2_MOSI_M2/ETH0_MCLK_M0/SAI4_MCLK_M1/FLEXBUS0_D8	GPIO3_B0_d/ PWM0_CH0_M3	3.3V

J1	Signal	Description or functions	GPIO serial	IO Voltage
65	LCDC_D10/EBC_SDDO10/DSMC_DATA6	I2C5_SCL_M3/UART11_RX_M0/SPI2_MISO_M2/SAI1_SDO2_M1/FLEXBUS1_D8/CAN0_RX_M3	GPIO3_C1_d	3.3V
66	PHY1_LED1/CFG_LDO0/CIF_D3	Speed LED(PD4.7K) or VI_CIF_D3/SPI1_MOSI_M1/UART11_CTS_M1/PDM1_SDI2_M0/SAI2_SCLK_M1/PWM1_CH2_M2	GPIO2_C2(Note2)	3.3V
67	LCDC_D9/EBC_SDDO9/DSMC_INT1	I2C9_SCL_M3/UART11_RTS_M0/SPI4_MISO_M1/SAI2_SCLK_M2/FLEXBUS0_D9	GPIO3_C2_d/ PWM2_CH0_M3	3.3V
68	PHY1_LED2/CFG_LDO1/CIF_D4	Link LED(PU4.7K) or VI_CIF_D4/SPI1_CS1_M1/UART9_TX_M1/PDM1_CLK1_M0/SAI2_MCLK_M1/PWM1_CH1_M2	GPIO2_C1(Note2)	3.3V
69	LCDC_D8/EBC_SDDO8/DSMC_INT3	I2C9_SDA_M3/UART11_CTS_M0/SPI4_MOSI_M1/SAI2_LRCK_M2/FLEXBUS0_D10/FLEXBUS0_CSN_M2	GPIO3_C3_d/ PWM2_CH1_M3	3.3V
70	LCDC_D20/EBC_VCOM/DSMC_DATA13	UART10_RTS_M0/UART1_TX_M2/ETH0_RXCTL_M0/PDM1_CLK1_M2/FlexBUS0_D5	GPIO3_A7_d	3.3V
71	GND	Ground		0V
72	LCDC_D21/EBC_GDOE/DSMC_DATA14	UART10_CTS_M0/UART1_RX_M2/ETH0_MDC_M0/PDM1_SDI2_M2/FlexBUS0_D6	GPIO3_A6_d/ PWM1_CH2_M3	3.3V
73	LCDC_D7/EBC_SDDO7/DSMC_DATA5	I2C5_SCL_M3/UART11_TX_M0/SPI2_CSN0_M2/SAI1_SDO0_M1/FLEXBUS1_D7/CAN0_TX_M3	GPIO3_C4_d	3.3V
74	LCDC_D22/EBC_GDSP/DSMC_DATA15	SPI2_CSn1_M2/UART1_RTS_M2/ETH0_MDIO_M0/PDM1_SDI3_M2/FlexBUS0_D7	GPIO3_A5_d/ PWM1_CH1_M3	3.3V
75	LCDC_D6/EBC_SDDO6/DSMC_DATA4	UART8_RX_M0/SPI1_MISO_M2/SAI1_SDO0_M1/FLEXBUS1_D6	GPIO3_C5_d/ PWM2_CH2_M3	3.3V
76	LCDC_D23/EBC_SDSHR/DSMC_RDYN	SPI2_CLK_M2/UART1_CTS_M2/ETH0_CLKOUT_25M_M0/SAI4_SDI_M1/FlexBUS1_D11/FlexBUS0_CSn_M0	GPIO3_A4_d/ PWM1_CH0_M3	3.3V

J1	Signal	Description or functions	GPIO serial	IO Voltage
77	LCDC_D5/EBC_SDDO5/DSMC_DATA3	UART8_TX_M0/SPI1_MOSI_M2/SAI1_LRCK_M1/FLEXBUS1_D5	GPIO3_C6_d	3.3V
78	PHY1_MDI3-/CIF_D5	ETH MDI or VI_CIF_D5/UART9_RX_M1/PDM1_SDI1_M0/PWM1_CH0_M2	GPIO2_C0(Note2)	3.3V
79	LCDC_D4/EBC_SDDO4/DSMC_DATA2	UART8_RTS_M0/SPI1_CLK_M2/SAI1_SCLK_M1/FLEXBUS1_D4	GPIO3_C7_d	3.3V
80	PHY1_MDI3+/CIF_D0	ETH MDI or VI_CIF_D0/SPI1_CLK_M1/UART11_RX_M1/PDM1_CLK0_M0/SAI2_SDI_M1/PWM1_CH4_M2	GPIO2_C5(Note2)	3.3V
81	LCDC_D3/EBC_SDDO3/DSMC_DATA1	UART8_CTS_M0/SPI1_CSN0_M2/SAI1_MCLK_M1/FLEXBUS1_D3	GPIO3_D0_d/ PWM2_CH3_M3	3.3V
82	PHY1_MDI2-/CIF_D2	ETH MDI or VI_CIF_D2/SPI1_MISO_M1/UART11_RTS_M1/PDM1_SDI3_M0/SAI2_LRCK_M1/PWM0_CH0_M2	GPIO2_C3(Note2)	3.3V
83	LCDC_D2/EBC_SDDO2/DSMC_CSN2	I3C1_SDA_PU_M2/SPI4_CLK_M1/SAI2_MCLK_M2/FLEXBUS0_D11/FLEXBUS1_CS_M2	GPIO3_D1_d	3.3V
84	PHY1_MDI2+/CIF_D1	ETH MDI or VI_CIF_D1/SPI1_CS0_M1/UART11_TX_M1/PDM1_SDI0_M0/SAI2_SDO_M1/PWM1_CH3_M2	GPIO2_C4(Note2)	3.3V
85	LCDC_D1/EBC_SDDO1/DSMC_CSN3	I3C1_SDA_M2/UART2_RTS_M2/SPI4_CSN1_M1/SAI2_SDI_M2/FLEXBUS0_D12/FLEXBUS0_CS_M3/FLEXBUS1_D15_M0	GPIO3_D2_d/ PWM2_CH4_M3	3.3V
86	PHY1_MDI1-	ETH MDI		0.5V
87	LCDC_D0/EBC_SDDO0/DSMC_CSN0	I3C1_SCL_M2/UART2_CTS_M2/SAI2_SDO_M2/FLEXBUS1_D2	GPIO3_D3_d/ PWM2_CH5_M3	3.3V
88	PHY1_MDI1+	ETH MDI		0.5V

J1	Signal	Description or functions	GPIO serial	IO Voltage
89	LCDC_CLK/EBC_SDOE/DSMC_RESETN	UART5_RTS_M0/SPI3_CSN1_M1/SAI4_SCLK_M1/FLEXBUS1_D12_M0/FLEXBUS0_D15_M0/FLEXBUS1_CSn_M1/CAM_CLK0_OUT_M0	GPIO3_D7_d/PWM2_CH7_M3	3.3V
90	PHY1_MDI0-	ETH MDI		0.5V
91	GND	Ground		0V
92	PHY1_MDI0+	ETH MDI		0.5V
93	HDMI_TX_ON_H	I2C4_SDA_M1/UART6_RX_M0/SPI3_MISO_M2/SAI4_LRCK_M0/PDM1_CLK0_M1/FlexBUS1_D14_M1/CAN0_RX_M2	GPIO4_A6_d	3.3V
94	GND	Ground		0V
95	TYPEC_DPTX_AUX_PUPDCTL2	I2C4_SCL_M1/UART6_TX_M0/SPI3_MOSI_M2/SAI4_SCLK_M0/PDM1_SDI3_M1/FlexBUS1_D13_M1/CAN0_TX_M2	GPIO4_A4_d	3.3V
96	LCDC_DEN/EBC_SDLE/DSMC_DATA0	I2C3_SCL_M2/UART5_RX_M0/SPI3_CLK_M1/SAI1_SDI1_M1/FLEXBUS1_D1	GPIO3_D4_d	3.3V
97	SPK_CTL_H	SPI3_CS1_M2/SPI4_CS0_M2/PDM1_SDI0_M1/SAI1_SDI0_M0/SAI4_SDO_M0	GPIO4_B3_d/PWM2_CH7_M0	3.3V
98	LCDC_VSYNC/EBC_SDCLK/DSMC_CLKN	UART5_CTS_M0/SPI3_MOSI_M1/SAI1_SDI3_M1/FLEXBUS1_CLK/PWM2_CH6_M3	GPIO3_D6_d	3.3V
99	HP_CTL_H	SPI3_CLK_M2/SAI4_SDI_M0/SAI1_SDO0_M0	GPIO4_A7_d/PWM2_CH6_M0	3.3V
100	LCDC_HSYNC/EBC_GDCLK/DSMC_CLKP	I2C3_SDA_M2/UART5_TX_M0/SPI3_MISO_M1/SAI1_SDI2_M1/FLEXBUS1_D0	GPIO3_D5_d	3.3V

NOTE:
1. Default used for RTC CLKO, can change to GPIO by HW.
2. Default used for ETH MDI, can change to GPIO by HW.

J2	Signal	Description or functions	GPIO serial	IO Voltage
1	USB2_OTG0_ID			1.8V
2	I2C3_SDA_M0	PCIE0_WAKE_M2/IUART2_RX_M1/SPDIF_RX0_M0/FlexBUS0_CSN_M4/CAN1_RX_M2	GPIO4_B4_d (PU2.2K)	3.3V

J2	Signal	Description or functions	GPIO serial	IO Voltage
3	USB2OTG0_VBUSDET	OTG0 VBUS Input		3.3V
4	I2C3_SCL_M0	PCIE0_CLKREQ_M2/IUART2_TX_M1/SPDIF_TX0_M0/FlexBUS0_D15_M1/CAN1_TX_M2	GPIO4_B5_d (PU2.2K)	3.3V
5	USB2_OTG0_DP			0.5V
6	HDMI_TX_HPDIN_M0	I2C7_SDA_M3/UART11_RX_M2/EDP_HPD_M0/PCIE1_CLKREQ_M3/DSM_ALN_M1	GPIO4_C1_d/ PWM0_CH1_M1	3.3V
7	USB2_OTG0_DM			0.5V
8	HDMI_TX_SDA	I2C2_SDA_M3/UART9_RX_M2/CAN0_RX_M1/DSM_ARN_M1	GPIO4_C3_d/ PWM2_CH1_M1	3.3V
9	DP_TX_AUXP			0.5V
10	HDMI_TX_SCL	I2C2_SCL_M3/UART9_TX_M2/CAN0_TX_M1/DSM_ARP_M1	GPIO4_C2_d/ PWM2_CH0_M1	3.3V
11	DP_TX_AUXN			0.5V
12	DP_HPDIN_M0	I2C3_SCL_M3/UART6_TX_M3/SPI4_CSn0_M0/SAI4_LRCK_M2/ISP_PRLIGHT_TRIG_M1	GPIO4_C4_d/ PWM2_CH6_M1	3.3V
13	GND	Ground		0V
14	HDMI_TX_CEC_M0	I2C7_SCL_M3/UART11_TX_M2/SPI4_CSn1_M0/SAI_MCLK_M2/DSM_ALP_M1	GPIO4_C0_d/ PWM1_CH5_M1/ PCIE1_WAKE_M3	3.3V
15	USB3_OTG0_SSRX1N /DP_TX_D0N			0.5V
16	PWM2_CH5_M1_FAN	I2C3_SDA_M3/UART6_RX_M3/SPI4_MOSI_M0/SAI4_SDO_M2/VP0_SYNC_OUT/ISP_FLASH_TRIGOUT_M1	GPIO4_C5_d/ PWM2_CH5_M1/ SATA1_ACTLED_M1 PCIE0_WAKE_M3	3.3V
17	USB3_OTG0_SSRX1P /DP_TX_D0P			0.5V
18	PCIE0_CLKREQn_M3	I2C6_SCL_M3/SPI4_MISO_M0/SAI4_SDI_M2/VP1_SYNC_OUT/CAN1_TX_M1	GPIO4_C6_d/ PWM2_CH2_M1/ SATA0_ACTLED_M1	3.3V
19	USB3_OTG0_SSTX1P/ DP_TX_D1P			0.5V
20	PCIE0_PERSTn	I2C6_SDA_M3/SPI4_CLK_M0/SAI4_SCLK_M2/VP2_SYNC_OUT/CAN1_RX_M1	GPIO4_C7_d/ PWM2_CH3_M1	3.3V

J2	Signal	Description or functions	GPIO serial	IO Voltage
21	USB3_OTG0_SSTX1N/ DP_TX_D1N			0.5V
22	USB2_OTG1_DM			0.5V
23	USB3_OTG0_SSRX2N /DP_TX_D2N			0.5V
24	USB2_OTG1_DP			0.5V
25	USB3_OTG0_SSRX2P /DP_TX_D2P			0.5V
26	GND	Ground		0V
27	GND	Ground		0V
28	MIPI_DPHY_DSI_TX_ D0N			0.5V
29	USB3_OTG0_SSTX2P/ DP_TX_D3P			0.5V
30	MIPI_DPHY_DSI_TX_ D0P			0.5V
31	USB3_OTG0_SSTX2N/ DP_TX_D3N			0.5V
32	MIPI_DPHY_DSI_TX_ D1N			0.5V
33	MIPI_DPHY_DSI_TX_ CLKN			0.5V
34	MIPI_DPHY_DSI_TX_ D1P			0.5V
35	MIPI_DPHY_DSI_TX_ CLKP			0.5V
36	GND	Ground		0V
37	GND	Ground		0V
38	MIPI_DPHY_DSI_TX_ D2N			0.5V
39	MIPI_DPHY_CSI0_RX _D0P			0.5V
40	MIPI_DPHY_DSI_TX_ D2P			0.5V
41	MIPI_DPHY_CSI0_RX _D0N			0.5V
42	MIPI_DPHY_DSI_TX_ D3N			0.5V
43	MIPI_DPHY_CSI0_RX _D1P			0.5V
44	MIPI_DPHY_DSI_TX_ D3P			0.5V

J2	Signal	Description or functions	GPIO serial	IO Voltage
45	MIPI_DPHY_CSI0_RX _D1N			0.5V
46	GND	Ground		0V
47	GND	Ground		0V
48	HDMI_TX_SBDN			0.5V
49	MIPI_DPHY_CSI0_RX _CLKP			0.5V
50	HDMI_TX_SBDP			0.5V
51	MIPI_DPHY_CSI0_RX _CLKN			0.5V
52	MIPI_DPHY_CSI2_RX _CLKP			0.5V
53	MIPI_DPHY_CSI0_RX _D2P			0.5V
54	MIPI_DPHY_CSI2_RX _CLKN			0.5V
55	MIPI_DPHY_CSI0_RX _D2N			0.5V
56	GND	Ground		0V
57	MIPI_DPHY_CSI0_RX _D3P			0.5V
58	MIPI_DPHY_CSI1_RX _CLKN			0.5V
59	MIPI_DPHY_CSI0_RX _D3N			0.5V
60	MIPI_DPHY_CSI1_RX _CLKP			0.5V
61	GND	Ground		0V
62	MIPI_DPHY_CSI1_RX _D3N			0.5V
63	HDMI_TX_D3N			0.5V
64	MIPI_DPHY_CSI1_RX _D3P			0.5V
65	HDMI_TX_D3P			0.5V
66	MIPI_DPHY_CSI1_RX _D2N			0.5V
67	HDMI_TX_D0P			0.5V
68	MIPI_DPHY_CSI1_RX _D2P			0.5V
69	HDMI_TX_D0N			0.5V
70	GND	Ground		0V
71	GND	Ground		0V

J2	Signal	Description or functions	GPIO serial	IO Voltage
72	MIPI_DPHY_CSI1_RX_D1N			0.5V
73	HDMI_TX_D1P			0.5V
74	MIPI_DPHY_CSI1_RX_D1P			0.5V
75	HDMI_TX_D1N			0.5V
76	GND	Ground		0V
77	HDMI_TX_D2P			0.5V
78	MIPI_DPHY_CSI1_RX_D0N			0.5V
79	HDMI_TX_D2N			0.5V
80	MIPI_DPHY_CSI1_RX_D0P			0.5V
81	GND	Ground		0V
82	GND	Ground		0V
83	LCD_PWREN_H	I2C3_SCL_M1/SPI0_CSn0_M0/SAI0_SCLK_M1	GPIO0_C6_d	3.3V
84	TP_INT_L	I3C0_SDA_PU_M0/UART10_RX_M2/SAI0_SDO0_M1/DP_HPD_M1	GPIO0_C5_d	3.3V
85	GPIO0_C4_d	UART10_TX_M2/PDM0_CLK0_M0/SAI0_MCLK_M1	PWM0_CH0_M0	3.3V
86	LCD_BL_PWM1_CH1_M0	I2C1_SDA_M1/UART4_RX_M2/REFCLK2_OUT	GPIO0_B5_d	3.3V
87	I2C0_SCL_M1_TP	I3C0_SCL_M0/UART8_TX_M2	GPIO0_C1_d	3.3V
88	PCIE1_WAKEn_M0	I2C4_SDA_M0/UART1_RTS_M0/PDM0_SDI3_M0/SAI0_SDO1/SDI3_M1	GPIO0_D3_d/ PWM2_CH0_M0	3.3V
89	I2C0_SDA_M1_TP	I3C0_SDA_M0/UART8_RX_M2	GPIO0_C2_d	3.3V
90	GPIO0_B4_d	I2C1_SCL_M1/UART4_TX_M2/REFCLK1_OUT	PWM1_CH0_M0	3.3V
91	UART0_TX_M0_DEBUG		GPIO0_D4_u	3.3V
92	USBCC_INT_L	SPI0_MISO_M0/PDM0_SDI1_M0/SAI0_SDO3/SDI1_M1	GPIO0_D1_d	3.3V
93	UART0_RX_M0_DEBUG		GPIO0_D5_u	3.3V
94	PCIE0_PWREN_H	I2C3_SDA_M1/SPI0_CLK_M0/SAI0_LRCK_M1	GPIO0_C7_d	3.3V

J2	Signal	Description or functions	GPIO serial	IO Voltage
95	TP_RST_L	SPI0_MOSI_M0/PDM0_SDI0_M0/SAI0_SDI0_M1	GPIO0_D0_d	3.3V
96	PCIE0_WAKEn_M0	I2C4_SCL_M0/UART1_CTS_M0/PDM0_SDI2_M0/SAI0_SDO2/SDI2_M1	GPIO0_D2_d/ PWM1_CH5_M0	3.3V
97	GND	Ground		0V
98	I2C2_SCL_M0	UART1_TX_M0/PWM1_CH4_M0	GPIO0_B7_d	3.3V
99	PWRON_L	Power Key input(PU)		3.4V-5.5V
100	I2C2_SDA_M0	UART1_RX_M0/PWM1_CH3_M0	GPIO0_C0_d	3.3V

J3	Signal	Description or functions	GPIO serial	IO Voltage
1	VCC_1V8_S3	1.8V GPIO Power output	Max 500mA	1.8V
2	GPIO0_A5_d_1V8	I2C6_SDA_M0	GPIO0_A5_d	1.8V
3	RESET_L	Reset Key in(PU10K)		1.8V
4	BT_WAKE_HOST_1V8	I2C0_SDA_M0	GPIO0_B1_z	1.8V
5	GND	Ground		0V
6	WIFI_WAKE_HOST_H_1V8	I2C0_SCL_M0	GPIO0_B0_z	1.8V
7	PCIE0_TXP			0.5V
8	I2C7_SCL_M1/E0_MDIO_M1_1V8	UART3_TX_M0/SPI3_CLK_M0/SAI3_SCLK_M2/ETH0_MDIO_M1/VI_CIF_HREF	GPIO3_A0_d	1.8V
9	PCIE0_TXN			0.5V
10	I2C7_SDA_M1/E0_MDC_M1_1V8	UART3_RX_M0/SPI3_MOSI_M0/SAI3_LRCK_M2/ETH0_MDC_M1/VI_CIF_VSYNC	GPIO3_A1_d	1.8V
11	PCIE0_RXP			0.5V
12	GND	Ground		0V
13	PCIE0_RXN			0.5V
14	PCIE0_REFCLKP			0.5V
15	VCC_3V3_S3	3.3V GPIO Power output	Max 500mA	3.3V
16	PCIE0_REFCLKN			0.5V
17	VCC_3V3_S3	3.3V GPIO Power output	Max 500mA	3.3V
18	PCIE1_REFCLKP			0.5V
19	PCIE1_TXP			0.5V
20	PCIE1_REFCLKN			0.5V
21	PCIE1_TXN			0.5V
22	GND	Ground		0V
23	GND	Ground		0V

J3	Signal	Description or functions	GPIO serial	IO Voltage
24	MIPI_DPHY_CSI3_RX_CLKP			0.5V
25	PCIE1_RXP			0.5V
26	MIPI_DPHY_CSI3_RX_CLKN			0.5V
27	PCIE1_RXN			0.5V
28	MIPI_DPHY_CSI3_RX_D3N			0.5V
29	PCIE1_PWREN_H	I2C2_SCL_M2/UART5_RTS_M1/SPI3_CS0_M2/SAI1_SCLK_M0/FlexBUS1_CS_M4	GPIO4_A3_d/PWM2_CH4_M1	3.3V
30	MIPI_DPHY_CSI3_RX_D3P			0.5V
31	PCIE1_CLKREQn_M2	I2C2_SDA_M2/UART5_CTS_M1/SPI4_CS1_M2/SAI1_LRCK_M0/FlexBUS1_D12_M1	GPIO4_A5_d	3.3V
32	MIPI_DPHY_CSI3_RX_D2N			0.5V
33	PCIE1_PERSTn	SPI4_MISO_M2/PDM1_SDI1_M1/SAI1_SDI1_M0/SAI1_SDO3_M0/FlexBUS1_D15_M1/MIPI_TE_M0	GPIO4_B2_d	3.3V
34	MIPI_DPHY_CSI3_RX_D2P			0.5V
35	DSMC_INT0/GPIO4_A0_d	I2C7_SCL_M2/UART3_TX_M0/SPI1_CSN1_M2/SAI4_LRCK_M1/FLEXBUS1_D14_M0/FLEXBUS0_D13_M0/FLEXBUS1_CSn_M3/CAM_CLK1_OUT_M0/MIPI_TE_M2/SPDIF_RX0_M1	GPIO4_A0_d	3.3V
36	GND	Ground		0V
37	DSMC_INT2/GPIO4_A1_d	I2C7_SDA_M2/UART3_RX_M0/SAI4_SDO_M1/FLEXBUS1_D13_M0/FLEXBUS0_D14_M0/FLEXBUS0_CSn_M1/CAM_CLK2_OUT_M0/VO_POST_EMPTY/SPDIF_TX0_M1	GPIO4_A1_d	
38	MIPI_DPHY_CSI3_RX_D1N			0.5V

J3	Signal	Description or functions	GPIO serial	IO Voltage
39	IRC_AIN	UART2_RTS_M1/UART6_RTS_M0/UART5_TX_M1/SPI4_CLK_M2/PDM1_CLK1_M1/SAI1_SDI3_M0/SAI1_SDO1_M0/FlexBUS1_D13_M1	GPIO4_B0_d	3.3V
40	MIPI_DPHY_CSI3_RX_D1P			0.5V
41	IRC_BIN	UART2_CTS_M1/UART6_CTS_M0/UART5_RX_M1/SPI4_MOSI_M2/PDM1_SDI2_M1/SAI1_SDI2_M0/SAI1_SDO2_M0/FlexBUS1_D14_M1	GPIO4_B1_d	3.3V
42	MIPI_DPHY_CSI3_RX_D0N			0.5V
43	TYPEC_DPTX_AUX_P_UPDCTL1	AUPLL_CLKIN_M2/SAI1/4_MCLK_M0/PWM2_CH5_M0	GPIO4_A2_d	3.3V
44	MIPI_DPHY_CSI3_RX_D0P			0.5V

1.7 Development Kit (SBC3576)

Power in
DC 5V

miniDP

USB3.0

2x Ethernet

HDMI in

HDMI out

Speaker

GPIO

RTC

GPIO

3x UART

Power

CAN

Recovery

RS485

WiFi&Bluetooth

Reset

Camera0

Micro SD

Headset

MIPI LCD

Camera2
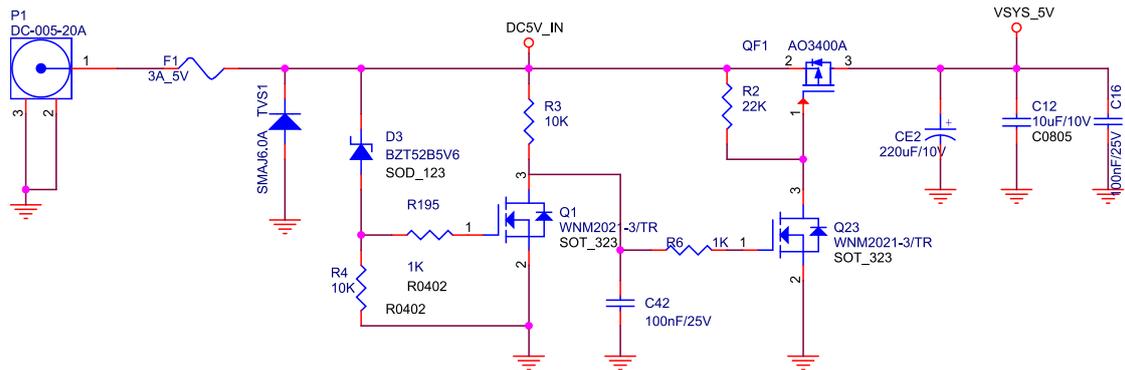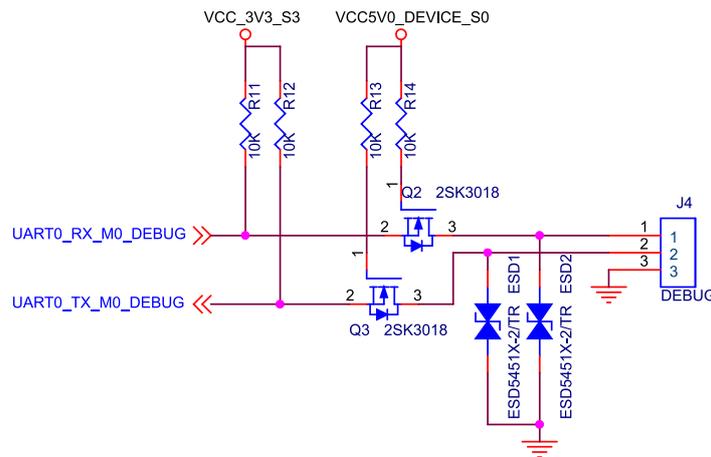
Debug

M.2
SSD or 4G/5G

Camera1

Nano SIM
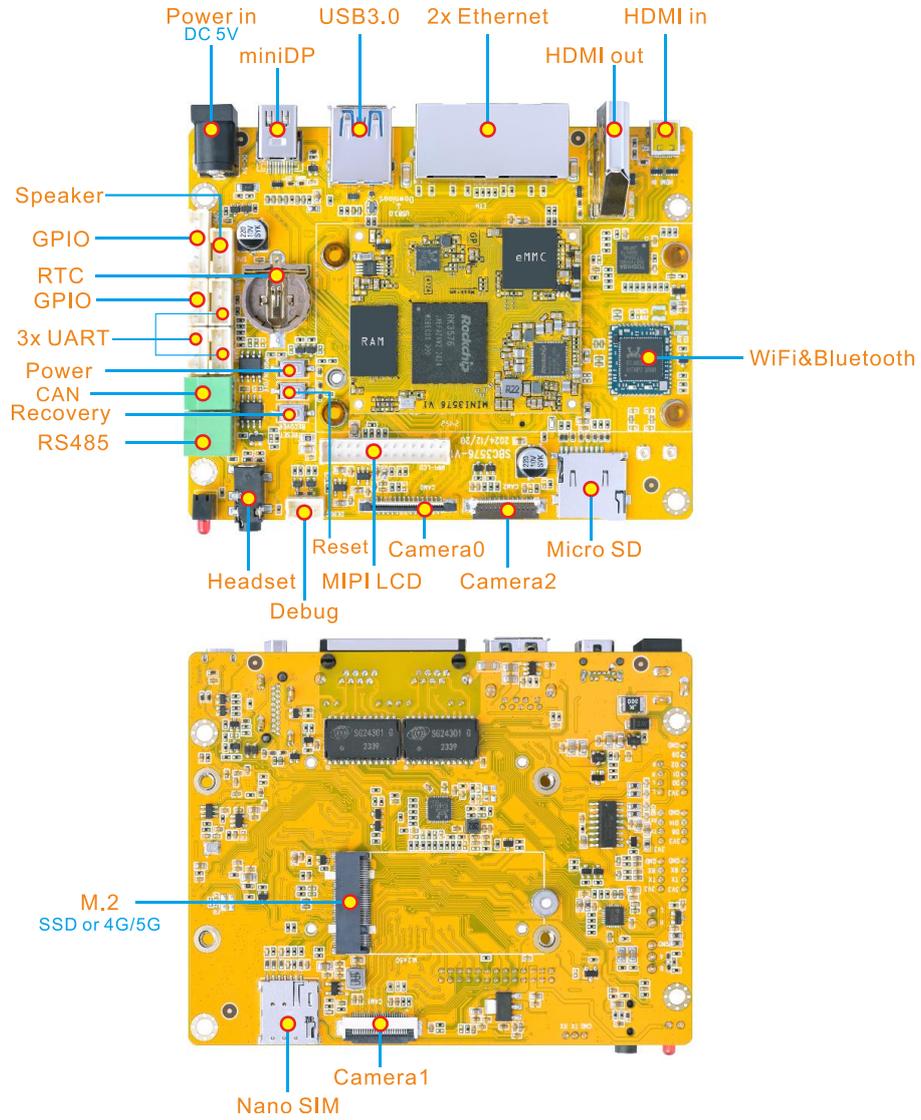
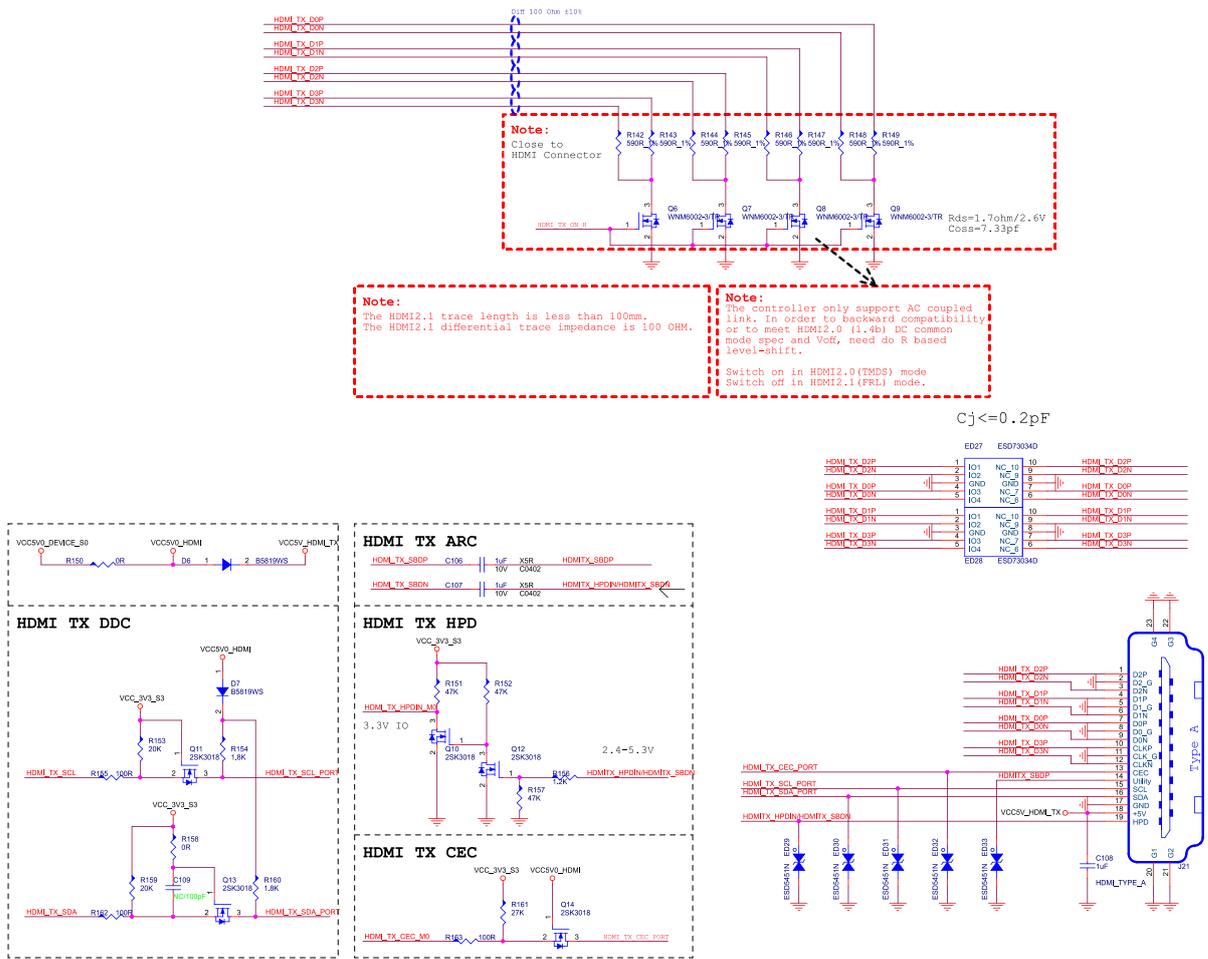# 2 Hardware Design Guide

2.1 Peripheral Circuit Reference

2.1.1 External Power

2.1.2 Debug Circuit

2.1.3 HDMI TX Circuit

2.2 Mother Board length offset

2.2.1 MIPI CSI1/2 4-Lane Interface length offset

	MIPI_DPHY_CSI1_RX_D0P	(-157)	(-160)
MIPI_DPHY_CSI1_RX_CLKP	MIPI_DPHY_CSI1_RX_D1P	(-58)	(-60)
/MIPI_DPHY_CSI2_RX_CLKP	MIPI_DPHY_CSI1_RX_D2P	(-58)	(-60)
	MIPI_DPHY_CSI1_RX_D3P	(-63)	(-70)

Yellow block is MINI3576 CSI1/2 group length difference.　　　　　　　　　　　Unit: mil
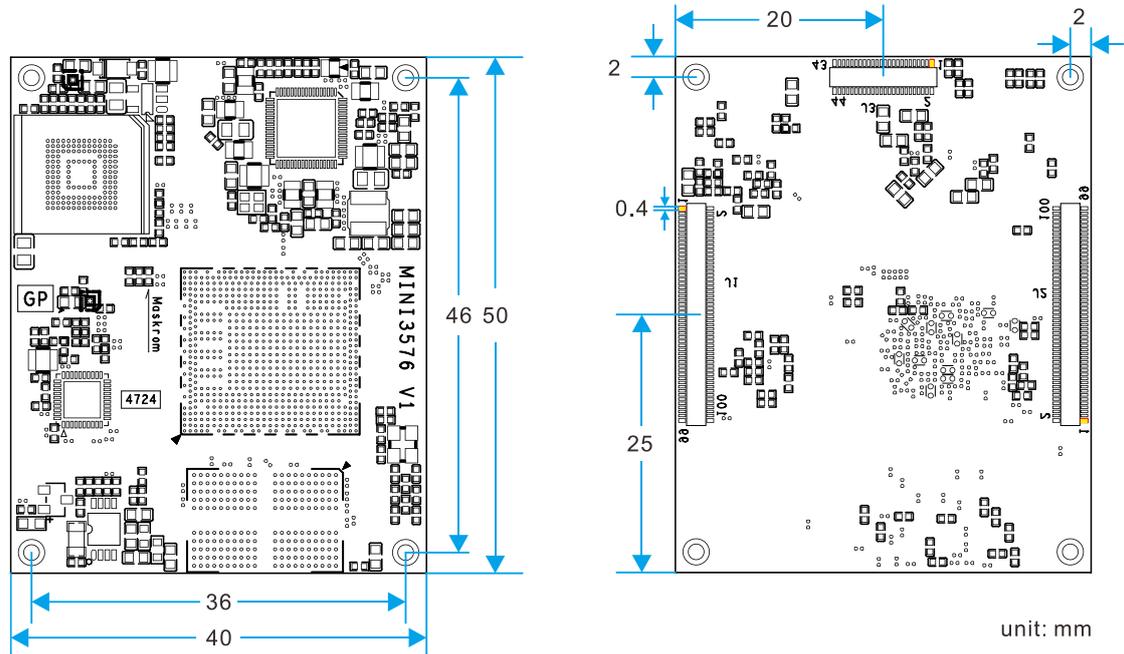
2.2.2 MIPI DSI 4-Lane Interface length offset

	MIPI_DPHY_DSI_TX_D0P	(143)	(+150)
MIPI_DPHY_DSI_TX_CLKP	MIPI_DPHY_DSI_TX_D1P	(118)	(+120)
	MIPI_DPHY_DSI_TX_D2P	(132)	(+140)
	MIPI_DPHY_DSI_TX_D3P	(91)	(+100)

Yellow block is MINI3576 DSI group length difference.

2.3 PCB Footprint

unit: mm

3 Product Electrical Characteristics

3.1 Dissipation and Temperature

Symbol	Parameter	Min	Typ	Max	Unit
VCC_SYS	System Voltage	3.4V	4	5.5	V
Isys_in	VCC_SYS input Current		1750		mA
VCC_RTC	RTC Voltage	1.8	3	3.4	V
Iirtc	RTC input Current		5	8	uA
I3v3_out	VCC_3V3 output Current			500	mA
I1v8_out	VCC_1V8 output Current			500	mA

Ta	Operating Temperature	0		70	°C
Tstg	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	