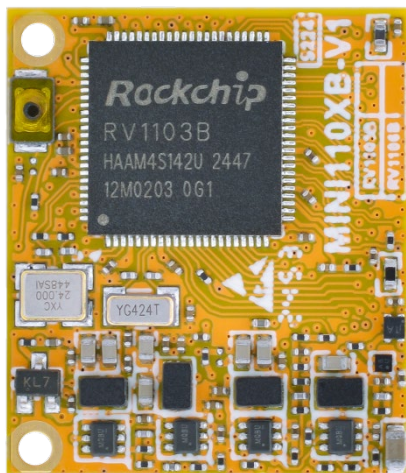


MINI110xB Reference User Manual

V1.202602



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 Mini110xB Introduction.....	3
1.1 Summary	3
1.2 Features.....	3
1.3 Block Diagram.....	5
1.4 Mini110xB specifications	6
1.5 Mini110xB PCB Dimension	7
1.6 Mini110xB Pin Definition	7
1.7 Development Kit (EM110xB).....	11
2 Hardware Design Guide.....	12
2.1 Peripheral Circuit Reference.....	12
2.2 PCB Footprint	13
2.3 B2B connector	13
3 Product Electrical Characteristics	14
3.1 Dissipation and Temperature	14
3.2 Reliability of Test.....	14

1 Mini110xB Introduction

1.1 Summary

The Mini110xB system-on-module is equipped with Rockchip's RV1103, RV1103B or RV1106B build in single-core Cortex-A7, 0.5 TOPs NPU and High-Process MCU. Can selected 64MB~256MB SIP RAM. It is designed specifically for the IPC/CVR devices, AI Camera devices, and mini robots. The highly integrated and low power solution can help customers to introduce new technologies more quickly and enhance the overall solution efficiency.

1.2 Features

- **Microprocessor**
 - Single-core Cortex-A7 up to 1.2G
 - 32KB I-cache and 32KB D-cache for each core, 128KB L2 cache
 - 0.5 TOPs Neural Process Unit
 - HP MCU to support 250mS fast boot
 - Max 8M ISP
 - (RV1103 Max 4M ISP)

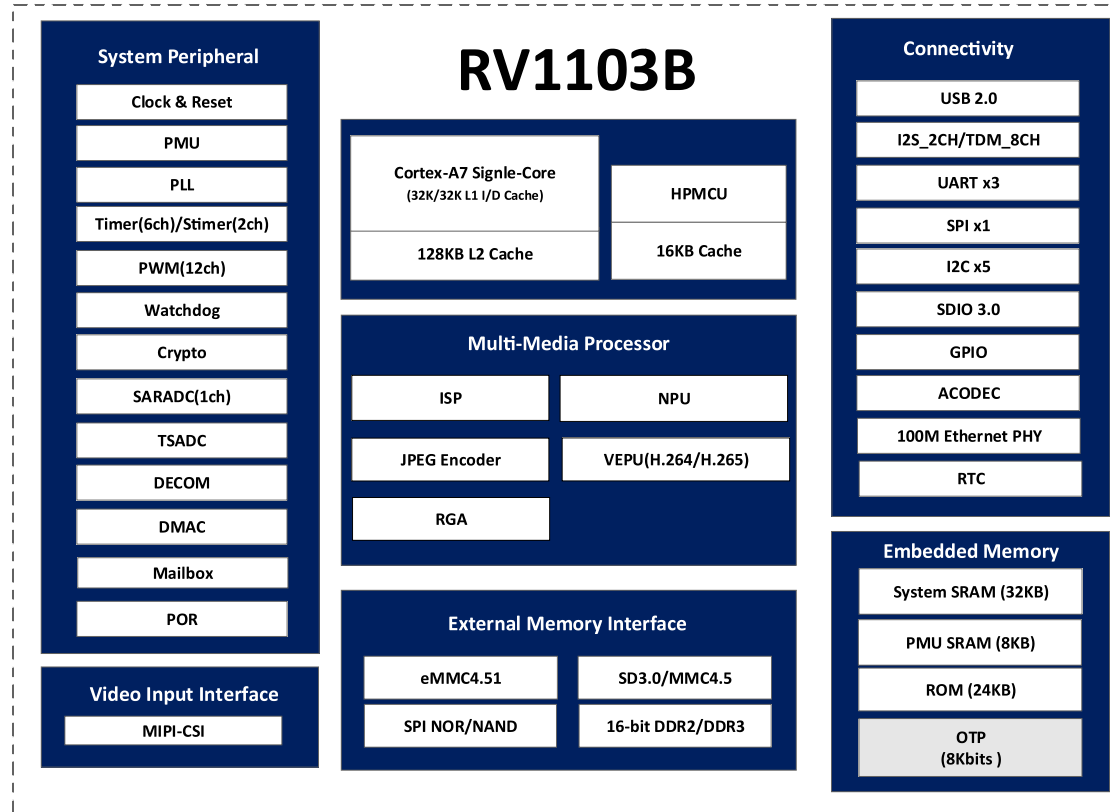
Memory Organization

- SIP DDR 64MB~256GB (Suffix Mark: G1~G3)
- EMMC4.51 up to 64GB
- Or SPI Flash up to 8MB
- **Video Decoder/Encoder**
 - Suffix G3 Supports video encode up to 4K@20fps
 - Suffix G1 Supports video encode up to 5M@30fps
 - Supports real-time H.264/HEVC video encoding
 - Picture size up to 2880x1620
- **Video Subsystem**
 - **Video Output**
 - Supports SPI MCU display interface up to 320x240 output
 - **Image in**
 - Supports up to 2-ch MIPI CSI 2lanes interface
 - Supports MIPI CSI 4lanes interface
- **Audio**
 - Support 1-ch I2S/PCM interface
 - Support Mic array Up to 2ch PDM/TDM interface
 - Embedded stereo Codec
 - Supports one analog MIC input and Line out
- **USB 2.0**
 - Support 1-ch 2.0 USB interfaces
 - Support USB 2.0 OTG or host

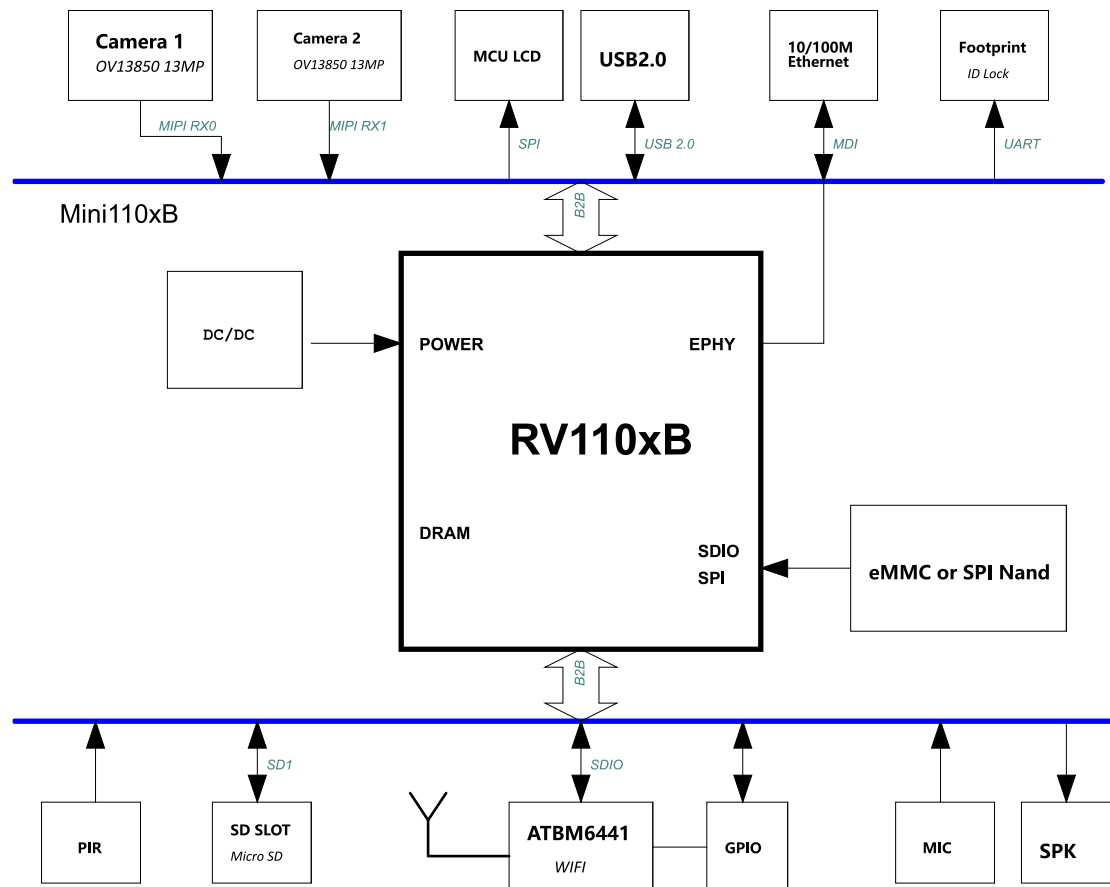
- **Ethernet (RV1103/3B Supported)**
 - Embedded 10/100M PHY
 - Support both full-duplex and half-duplex operation
- **I2C**
 - Up to five I2Cs
 - Support standard mode and fast mode (up to 400kbit/s)
- **SDIO**
 - Support 2-ch SDIO 3.0 protocol
- **SPI**
 - Up to 1-ch SPI controllers,
 - Full-duplex synchronous serial interface
- **UART**
 - Support up to 3-ch UARTs
 - UART0 with 2 wires for debug tools
 - Embedded two 64byte FIFO
 - Support hardware auto flow control mode by UART1-2
- **ADC**
 - Up to 1-CH ADC channels
 - 10-bit resolution
 - Voltage input range between 0V to 1.8V
 - Support up to 1MS/s sampling rate
- **PWM**
 - Total 12-ch with 3 PWMs interface
 - Only PWM0 can support one clock Frequency calculation engine and free running counter
 - Support continuous mode and one-shot output mode
 - Support input caption mode
- **Power unit**
 - Discrete Power on board
 - 5V input and RTC power input
(RV1103 not support RTC)
 - System power control
 - IO 3.3V and Standby 3.3V output
 - IO 1.8V output

1.3 Block Diagram

1.3.1 RV1103B Block Diagram



1.3.2 Development board (EM110xB) Block Diagram

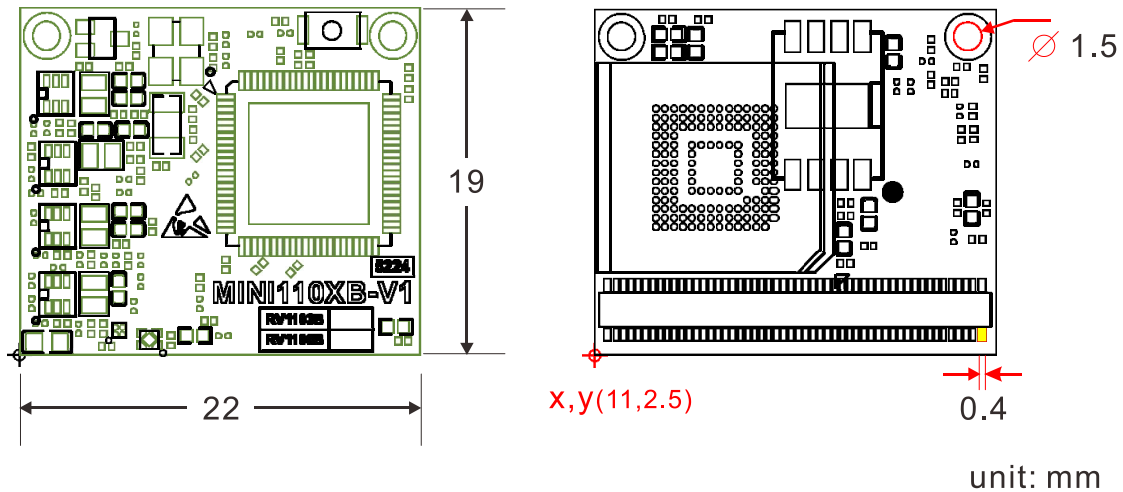


1.4 Mini110xB specifications

Feature	Specifications
CPU	Signal-core Cortex-A7
DDR	SIP 64MB~256MB (Suffix: G1~G3)
eMMC FLASH	8GB (up to 64GB)
Power	DC 5V
I2S	1-CH
MIPI CSI	2-CH 2-Lane or 1-CH 4-lane
LCD	SPI interface
USB	1-CH (USB HOST2.0 or OTG 2.0)
Ethernet	10/100M PHY embedded (RV1103/3B supported)
SDMMC	1-CH
I2C	3-CH
SPI	1-CH
UART	2-CH, 1-CH(DEBUG)

PWM	12-CH
ADC IN	1-CH
Board Dimension	22 x 19mm

1.5 Mini110xB PCB Dimension



1.6 Mini110xB Pin Definition

J1	Signal	Description or functions	GPIO serial	IO Voltage
1	VCC_SYS_IN	5V Main Power input		5V
2	VCC_SYS_IN	5V Main Power input		5V
3	VCC_SYS_IN	5V Main Power input		5V
4	VCC_SYS_IN	5V Main Power input		5V
5	VCC_SYS_IN	5V Main Power input		5V
6	VCC_SYS_IN	5V Main Power input		5V
7	VCC_SYS_IN	5V Main Power input		5V
8	VCC_SYS_IN	5V Main Power input		5V
9	NC			
10	NC			
11	PMU_PWREN	Power Enable input	PU 100K	5V
12	GND	Ground		0V
13	GND	Ground		0V
14	GND	Ground		0V
15	VCC3V3_STB	Standby 3.3V output	Max:500mA	3.3V
16	GND	Ground		0V
17	VCC3V3_STB	Standby 3.3V output	Max:500mA	3.3V
18	GND	Ground		0V

J1	Signal	Description or functions	GPIO serial	IO Voltage
19	VCC3V3_STB	Standby 3.3V output	Max:500mA	3.3V
20	VBAT	RTC Battery input		3.3V
21	VCC3V3	IO 3.3V output	Max:300mA	3.3V
22	PG1	System Power Good output	PU 100K	5V
23	VCC3V3	IO 3.3V output	Max:300mA	3.3V
24	GND	Ground		0V
25	GND	Ground		0V
26	SOC_32K_CLKO/G PIO0_A0_z	CLK_24M_OUT	GPIO0_A0_z	3.3V
27	UART0_TX_DBG	JTAG_TCK_M0/I2C0_SCL_M0/ PWM0_CH1_M0	GPIO0_A5_d	3.3V
28	GND	Ground		0V
29	UART0_RX_DBG	JTAG_TMS_M0/I2C0_SDA_M0/ PWM0_CH2_M0	GPIO0_A6_u	3.3V
30	WIFI_WAKEUP_SO C	PWR_CTRL_M1	GPIO0_A4_d	3.3V
31	VCC_1V8	IO 1.8V output	Max:150mA	1.8V
32	SOC_WAKEUP_WI FI	PWM0_CH3_M0	GPIO0_A2_d	3.3V
33	GND	Ground		0V
34	GND	Ground		0V
35	SDIO_CLK	SDMMC1_CLK/SPI0_CLK_M1/ UART1_TX_M3/PWM0_CH2_M 1	GPIO2_A2_d	3.3V
36	SDIO_D1	SDMMC1_D1/SPI0_CS1_M1/U ART1_RTS_M3/PWM0_CH0_M 1	GPIO2_A0_d	3.3V
37	GND	Ground		0V
38	SDIO_D0	SDMMC1_D0/SPI0_MOSI_M1/ UART1_CTS_M3/PWM0_CH1_ M1	GPIO2_A1_d	3.3V
39	SDIO_CMD	SDMMC1_CMD/SPI0_CS0_M1/ UART1_RX_M3/PWM1_CH0_M 1	GPIO2_A3_d	3.3V
40	GND	Ground		0V
41	SDIO_D3	SDMMC1_D3/SPI0_MISO_M1/ UART1_RTS_M2/PWM1_CH1_ M1/I2C1_SCL_M1_ETH_DPX- LED	GPIO2_A4_d	3.3V
42	SARADC_IN0_1V8		GPIO2_B4_z (PU 10K)	1.8V

J1	Signal	Description or functions	GPIO serial	IO Voltage
43	SDIO_D2	UART1_CTS_M2/PWM1_CH2_M1/I2C1_SDA_M1	GPIO2_A5_d	3.3V
44	W_LED_PWM	UART1_TX_M2/PWM2_CH0_M1/I2C2_SCL_M1/SAI_SDI/ETH_LNK-LED	GPIO2_A6_d	3.3V
45	GND	Ground		0V
46	IR_LED_PWM	UART1_RX_M2/PWM2_CH1_M1/I2C2_SDA_M1/SPI0_CS1_M0/SAI_SCLK/ETH_SPD-LED	GPIO2_A7_d	3.3V
47	LUX_EN	FEPHY_AVDD1V8 SPI2AHB_D3/UART2_TX_M0/PWM1_CH0_M0/I2C1_SCL_M0	POWER (Note1) GPIO0_B0_d(Note2)	1.8V /3.3V
48	LED_PWREN	UART2_TX_M1/PWM0_CH3_M1/I2C4_SCL_M0/SAI_MCLK/SPI0_CLK_M0/FLASH_TRIG	GPIO2_B0_d	3.3V
49	SDMMC0_PWREN	FEPHY_REXT SPI2AHB_D2/UART2_RX_M0/PWM1_CH1_M0/I2C1_SDA_M0	POWER (Note1) GPIO0_B1_d(Note2)	0V 3.3V
50	MIPI_PDN	UART2_TX_M1/PWM0_CH3_M1/I2C4_SCL_M0/SAI_MCLK/SPI0_CLK_M0/FLASH_TRIG	GPIO2_B1_d	3.3V
51	FEPHY_TXP/ SPK_CTRL	FEPHY_TXP SPI2AHB_D1/UART1_RX_M0/UART2_RTS_M0/PWM1_CH2_M0/I2C2_SCL_M0	MDI (Note1) GPIO0_B2_d(Note2)	0V 3.3V
52	IRCUT_A	UART2_RTS_M1/PWM2_CH2_M1/I2C3_SDA_M1/SAI_SDO/SPI0_CS0_M0	GPIO2_B2_d	3.3V
53	FEPHY_TXN/ GPIO0_B3_u	FEPHY_TXN SPI2AHB_CS _n /UART1_TX_M0/UART2_CTS_M0/PWM1_CH3_M0/I2C2_SDA_M0	MDI (Note1) GPIO0_B3_d(Note2)	0V 3.3V
54	IRCUT_B	UART2_CTS_M1/PWM2_CH3_M1/I2C3_SCL_M1/SPI0_MISO_M0	GPIO2_B3_d	3.3V
55	FEPHY_RXP/ GPIO0_B4_d/I2C3_SCL_M0	FEPHY_RXP SPI2AHB_CLK/UART0_TX_M1/UART1_RTS_M0/JTAG_TCK_M1/I2C3_SCL_M0	MDI (Note1) GPIO0_B4_d(Note2)	0V 3.3V
56	GND	Ground		0V

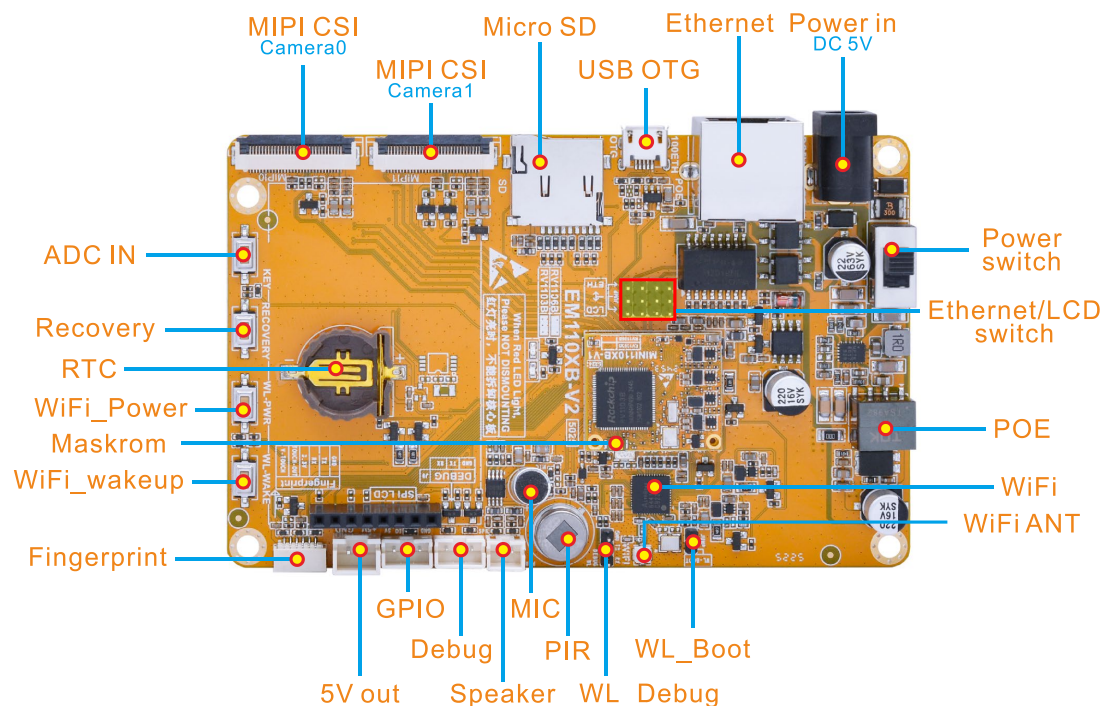
J1	Signal	Description or functions	GPIO serial	IO Voltage
57	FEPHY_RXN/ GPIO0_B5_u/I2C3_ SDA_M0	FEPHY_RXN SPI2AHB_D0/UART0_RX_M1/U ART1_CTS_M0/JTAG_TMS_M1 /I2C3_SDA_M0	MDI (Note1) GPIO0_B5_u(Note2)	0V 3.3V
58	VCC_MICBIAS	MICBIAS Power output		1.8V
59	GND	Ground		0V
60	MICIN_P	Microphone positive input		0V
61	MIPI_RX_D3N	MIPI CSI0 D3 or CSI1 D1	GPI1_C1_u(Note3)	0.6V/1.8V
62	MICIN_N	Microphone negative input		0V
63	MIPI_RX_D3P	MIPI CSI0 D3 or CSI1 D1	GPI1_C2_u(Note3)	0.6V/1.8V
64	GND	Ground		0V
65	GND	Ground		0V
66	LINEOUT			0V
67	MIPI_RX_CLK1N	MIPI CSI1 CLK	GPI1_C3_u(Note3)	0.6V/1.8V
68	CODEC_AVSS	Audio Ground		0V
69	MIPI_RX_CLK1P	MIPI CSI1 CLK	GPI1_C4_u(Note3)	0.6V/1.8V
70	GND	Ground		0V
71	GND	Ground		0V
72	USB_DP			1.8V
73	MIPI_RX_D2N	MIPI CSI0 D2 or CSI1 D0	GPI1_C5_u(Note3)	0.6V/1.8V
74	USB_DM			1.8V
75	MIPI_RX_D2P	MIPI CSI0 D2 or CSI1 D0	GPI1_C6_u(Note3)	0.6V/1.8V
76	GND	Ground		0V
77	GND	Ground		0V
78	SDMMC_D2	SDMMC0_D2/UART0_TX_M2/J TAG_TCK_M2/PWM2_CH2_M0/ I2C0_SCL_M1	GPIO1_B4_d	3.3V
79	MIPI_RX_D1N	MIPI CSI0 D1	GPI1_D0_u(Note3)	0.6V/1.8V
80	SDMMC_D3	SDMMC0_D3/UART0_RX_M2/J TAG_TMS_M2/PWM2_CH3_M0 /I2C0_SDA_M1	GPIO1_B3_d	3.3V
81	MIPI_RX_D1P	MIPI CSI0 D1	GPI1_D1_u(Note3)	0.6V/1.8V
82	SDMMC_CMD	SDMMC0_CMD/UART1_CTSN_ M1	GPIO1_B2_d	3.3V
83	GND	Ground		0V
84	SDMMC_CLK	SDMMC0_CLK/UART1_RTSN_ M1	GPIO1_B1_d	3.3V
85	MIPI_RX_CLKN	MIPI CSI0 CLK	GPI1_D2_u(Note3)	0.6V/1.8V
86	GND	Ground		0V
87	MIPI_RX_CLKP	MIPI CSI0 CLK	GPI1_D3_u(Note3)	0.6V/1.8V
88	SDMMC_D0	SDMMC0_D0/UART1_TX_M1/P WM2_CH0_M0	GPIO1_B0_d	3.3V

J1	Signal	Description or functions	GPIO serial	IO Voltage
89	GND	Ground		0V
90	SDMMC_D1	SDMMC0_D1/UART1_RX_M1/PWM2_CH1_M0	GPIO1_A7_d	3.3V
91	MIPI_RX_D0N	MIPI CSI0 D0	GPI1_D4_u(Notes)	0.6V/1.8V
92	GND	Ground		0V
93	MIPI_RX_D0P	MIPI CSI0 D0	GPI1_D5_u(Notes)	0.6V/1.8V
94	SDMMC_DET	SDMMC0_DET	GPIO1_A6_u	3.3V
95	GND	Ground		0V
96	MIPI_RST	CAM_CLK1_OUT/I2C0_SDA_M2/UART2_RX_M2	GPIO1_B6_d	1.8V
97	MIPI_I2C_SCL	I2C4_SCL_M1/UART2_RTSN_M2/ PWM0_CH1_M2	GPIO1_B7_d	1.8V
98	GND	Ground		0V
99	MIPI_I2C_SDA	I2C4_SDA_M1/UART2_CTSN_M2/PWM0_CH2_M2	GPIO1_C0_d	1.8V
100	MIPI_MCLK	CAM_CLK0_OUT/I2C0_SCL_M2/UART2_TX_M2	GPIO1_B5_d	1.8V

Note:

1. Red word function is for the RV1103/3B support, and black one is for RV1106B.
2. The SPI2AHB port only support slave mode.
3. MIPI CSI GPI only support input.

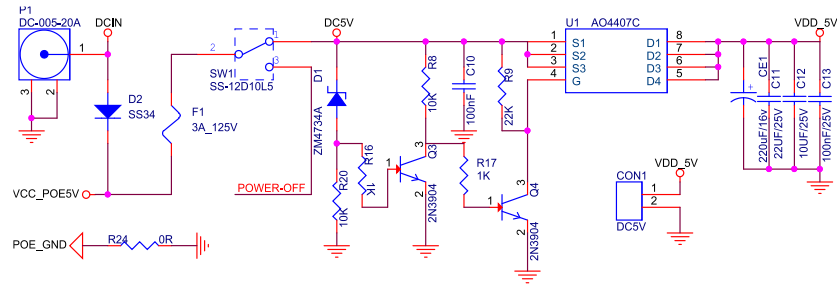
1.7 Development Kit (EM110xB)



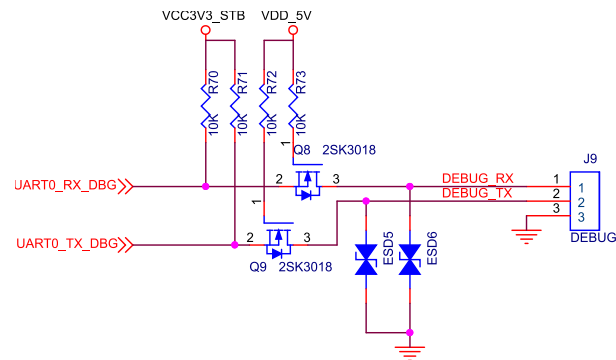
2 Hardware Design Guide

2.1 Peripheral Circuit Reference

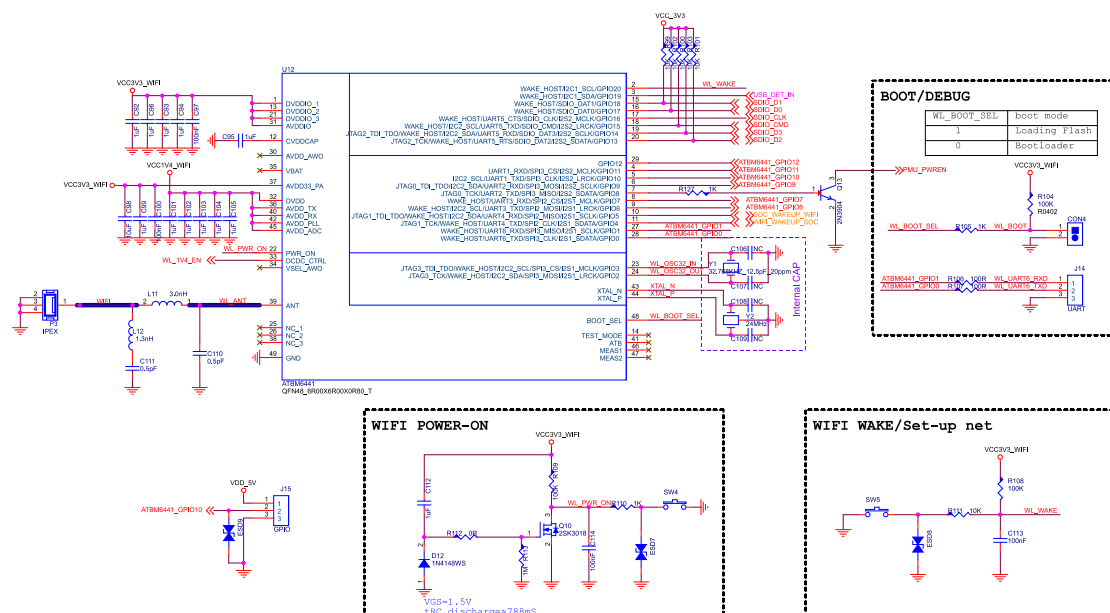
2.1.1 Power Circuit



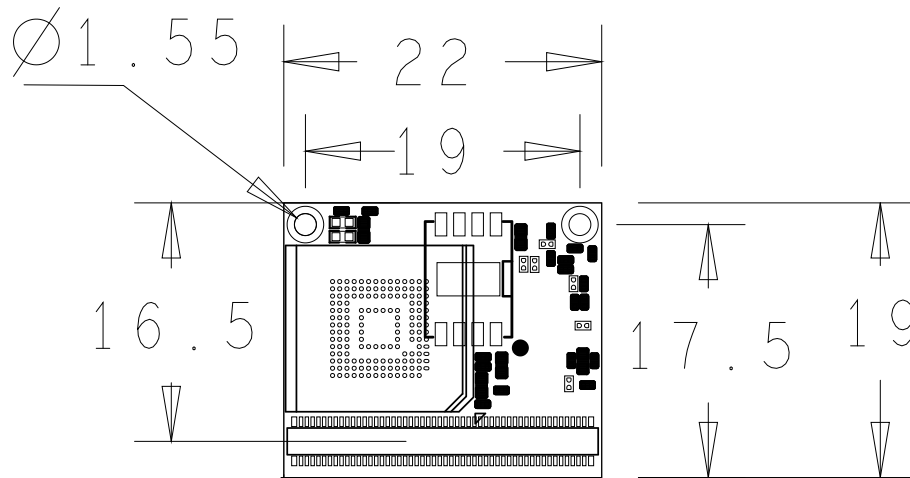
2.1.2 Debug Circuit



2.1.3 WIFI Circuit

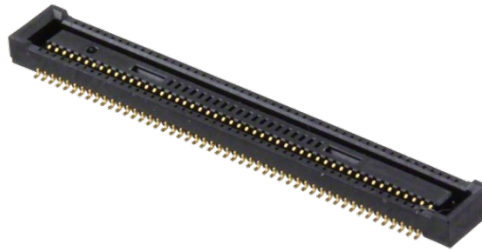


2.2 PCB Footprint

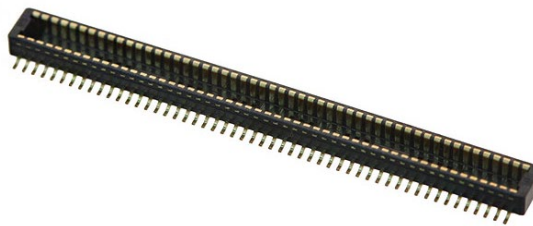


2.3 B2B connector

Header for carrier board: DF40C-100DS-0.4V



Receptacle for CPU board: DF40C-100DP-0.4V



3 Product Electrical Characteristics

3.1 Dissipation and Temperature

Symbol	Parameter	Min	Typ	Max	Unit
VCC5V_SYS	System IO Voltage	3.6	5	5.5	V
I _{sys_in}	VCC5V_SYS input Current			1200	mA
VCC_RTC	RTC Voltage	3	3.3	3.8	V
I _{rtc}	RTC input Current		0.8	2	uA
VCC3V3_STB	3.3V Standby Voltage output		3.3		V
I _{vcc3v3_stb}	VCC3V3_STB output Current		500		mA
VCC_3V3	3.3V IO Voltage output		3.3		V
I _{vcc_3v3}	VCC_3V3 output Current		300		mA
VCC_1V8	1.8V IO Voltage output		1.8		V
I _{vcc_1v8}	VCC_1V8 output Current		150		mA
T _a	Operating Temperature	-20		70	°C
T _{stg}	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	