

SMA-X8I, REV-SA03

NXP IMX8M Mini, SMARC V2.1 RISC Module

User's Manual

2nd Ed – 24 February 2022

FCC Statement



THIS DEVICE COMPLIES WITH PART 15 FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS:

- (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE.
- (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.

THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS "A" DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES.

THESE LIMITS ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST HARMFUL INTERFERENCE WHEN THE EQUIPMENT IS OPERATED IN A COMMERCIAL ENVIRONMENT. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS.

OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE HARMFUL INTERFERENCE IN WHICH CASE THE USER WILL BE REQUIRED TO CORRECT THE INTERFERENCE AT HIS OWN EXPENSE.

A Message to the Customer

Avalue Customer Services

Each and every Avalue's product is built to the most exacting specifications to ensure reliable performance in the harsh and demanding conditions typical of industrial environments. Whether your new Avalue device is destined for the laboratory or the factory floor, you can be assured that your product will provide the reliability and ease of operation for which the name Avalue has come to be known.

Your satisfaction is our primary concern. Here is a guide to Avalue's customer services. To ensure you get the full benefit of our services, please follow the instructions below carefully.

Technical Support

We want you to get the maximum performance from your products. So if you run into technical difficulties, we are here to help. For the most frequently asked questions, you can easily find answers in your product documentation. These answers are normally a lot more detailed than the ones we can give over the phone. So please consult the user's manual first.

To receive the latest version of the user's manual; please visit our Web site at:

<http://www.avalue.com.tw/>

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1. Getting Started

1.1 Safety Precautions

Warning!



Always completely disconnect the power cord from your chassis whenever you work with the hardware. Do not make connections while the power is on. Sensitive electronic components can be damaged by sudden power surges. Only experienced electronics personnel should open the PC chassis.

Caution!



Always ground yourself to remove any static charge before touching the CPU card. Modern electronic devices are very sensitive to static electric charges. As a safety precaution, use a grounding wrist strap at all times. Place all electronic components in a static-dissipative surface or static-shielded bag when they are not in the chassis.

Always note that improper disassembling action could cause damage to the motherboard. We suggest not removing the heatsink without correct instructions in any circumstance. If you really have to do this, please contact us for further support.

1.2 Packing List

Before you begin installing your single board, please make sure that the following materials have been shipped:

- 1 x SMA-X8I Risc Module
- 1 x REV-SA03 Carrier board



If any of the above items is damaged or missing, contact your retailer.

1.3 Document Amendment History

Revision	Date	By	Comment
1 st	May 2021	Avalue	Initial Release
2 nd	February 2022	Avalue	Update 2.3 SMA-X8I Setting Jumpers

1.4 Manual Objectives

This manual describes in details Avalue Technology SMA-X8I, REV-SA03.

We have tried to include as much information as possible but we have not duplicated information that is provided in the standard IBM Technical References, unless it proved to be necessary to aid in the understanding of this board.

We strongly recommend that you study this manual carefully before attempting to set up SMA-X8I series or change the standard configurations. Whilst all the necessary information is available in this manual we would recommend that unless you are confident, you contact your supplier for guidance.

If you have any suggestions or find any errors regarding this manual and want to inform us of these, please contact our Customer Service department with the relevant details.

1.5 System Specifications

SMA-X8I	
System	
CPU	CPU NXP IMX8M Mini Consumer : MIMX8MM6DVTLZAA, Operating temperature : 0~95 (°C) Industrial : MIMX8MM6CVTKZAA, Operating temperature : -40~105 (°C)
System Memory	1~4GB LPDDR4
EMMC	8~64GB eMMC
FLASH	8MB QSPI
WIFI/BT	Wifi2.4G+5G +BT 4.1 (Optional) This IC is not going to be installed. A certification fee is required if the customers want it installed.
Mechanical & Environmental	
Operating Temp.	Consumer temperature : 0~60 Degree Industrial temperature : -40~85 Degree (Default)
Storage Temp.	-40~85
Operating Humidity	95%
Size (L x W) (Please consult product engineers for the production feasibility if the size is larger than 410x360mm or smaller than 80x70mm)	82mm x 50mm As low as 1.5mm (Carrier Board top to Module bottom) Other stack height options available, including 2.7mm, 5mm, 8mm Overall assembly height (Carrier Board top to tallest Module component) is less than 6mm Fanless Design
Weight	20g
Random Vibration Operation	1. PSD: 0.00454G ² /Hz , 1.5 Grms 2. operation mode 3. Test Frequency : 5-500Hz 4. Test Axis : X,Y and Z axis 5. 30 minutes per each axis 6. IEC 60068-2-64 Test:Fh 7. Storage : CF or SSD
Random Vibration	1 Test Acceleration : 3G 2 Test frequency : 5~500 Hz

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Non-Operation	<p>3 Sweep : 1 Oct/ per one minute. (logarithmic)</p> <p>4 Test Axis : X,Y and Z axis</p> <p>5 Test time :30 min. each axis</p> <p>6 System condition : Non-Operating mode</p> <p>7. Reference IEC 60068-2-64 Testing procedures</p>
Bump Test	<p>1. Wave form : Half Sine wave</p> <p>2. Acceleration Rate : 10g for operation mode</p> <p>3. Duration Time : 11ms</p> <p>4. No. of Shock : Z axis 1000 times</p> <p>5. Test Axis: Z axis</p> <p>6. Operation mode</p> <p>7. Reference IEC 60068-2-29 Testing procedures</p> <p>Test Eb : Bump Test</p>
OS Information	<p>Android 10</p> <p>Linux Yocto sumo 2.5 (Default)</p>

REV-SA03	
System	
SMARC	<p>SMARC V2.1</p> <p>Compatible with Avalue and other SMARC modules</p> <p>CPU Modules. (82 x 50mm)</p>
External I/O Connector	<p>1 x Power Key</p> <p>1 x Reset Key</p> <p>1 x DC Jack</p> <p>1 x USB 2.0 Type A</p> <p>1 x USB 3.0 Type A</p> <p>J3 (reserved design for USB3.0)1 x USB Type C</p> <p>1 x Giga Ethernet</p> <p>1 x Headphone</p> <p>1 x Micro SD Socket</p> <p>1 x SIM Socket</p>
Internal I/O Connector	<p>1 x Mic Phone 2P Header</p> <p>1 x Speaker (Left/Right Channel) 2P Header</p> <p>1 x RTC-Battery (CR2032)</p> <p>1 x M.2 Key E for WIFI /BT</p> <p>1 x M.2 Key B for LTE</p> <p>1 x M.2 Key M for Storage</p> <p>1 x A53 Core Debug connector (UART)</p> <p>1 x M4 Core Debug connector (UART)</p> <p>1 x BackLight 4P Header</p>

	<p>1 x I2C Touch Screen connector</p> <p>1 x MIPI DSI Screen connector for MIPI Panel</p> <p>1 x MIPI CSI Screen connector for MIPI Camera</p> <p>1 x LVDS Screen connector</p> <p>1 x GPIO 16 bit</p> <p>1 x CAN Bus</p>
Mechanical & Environmental	
Power Requirement	12V
Operating Temp.	-40~85 Degree
Storage Temp.	-40~85 Degree
Operating Humidity	95%
Size (L x W) (Please consult product engineers for the production feasibility if the size is larger than 410x360mm or smaller than 80x70mm)	165mm x 120mm
Weight	140g
Random Vibration Operation	<ol style="list-style-type: none"> 1. PSD: 0.00454G²/Hz , 1.5 Grms 2. operation mode 3. Test Frequency : 5-500Hz 4. Test Axis : X,Y and Z axis 5. 30 minutes per each axis 6. IEC 60068-2-64 Test:Fh 7. Storage : CF or SSD
Random Vibration Non-Operation	<ol style="list-style-type: none"> 1 Test Acceleration : 3G 2 Test frequency : 5~500 Hz 3 Sweep : 1 Oct/ per one minute. (logarithmic) 4 Test Axis : X,Y and Z axis 5 Test time :30 min. each axis 6 System condition : Non-Operating mode 7. Reference IEC 60068-2-64 Testing procedures
Bump Test	1. Wave form : Half Sine wave

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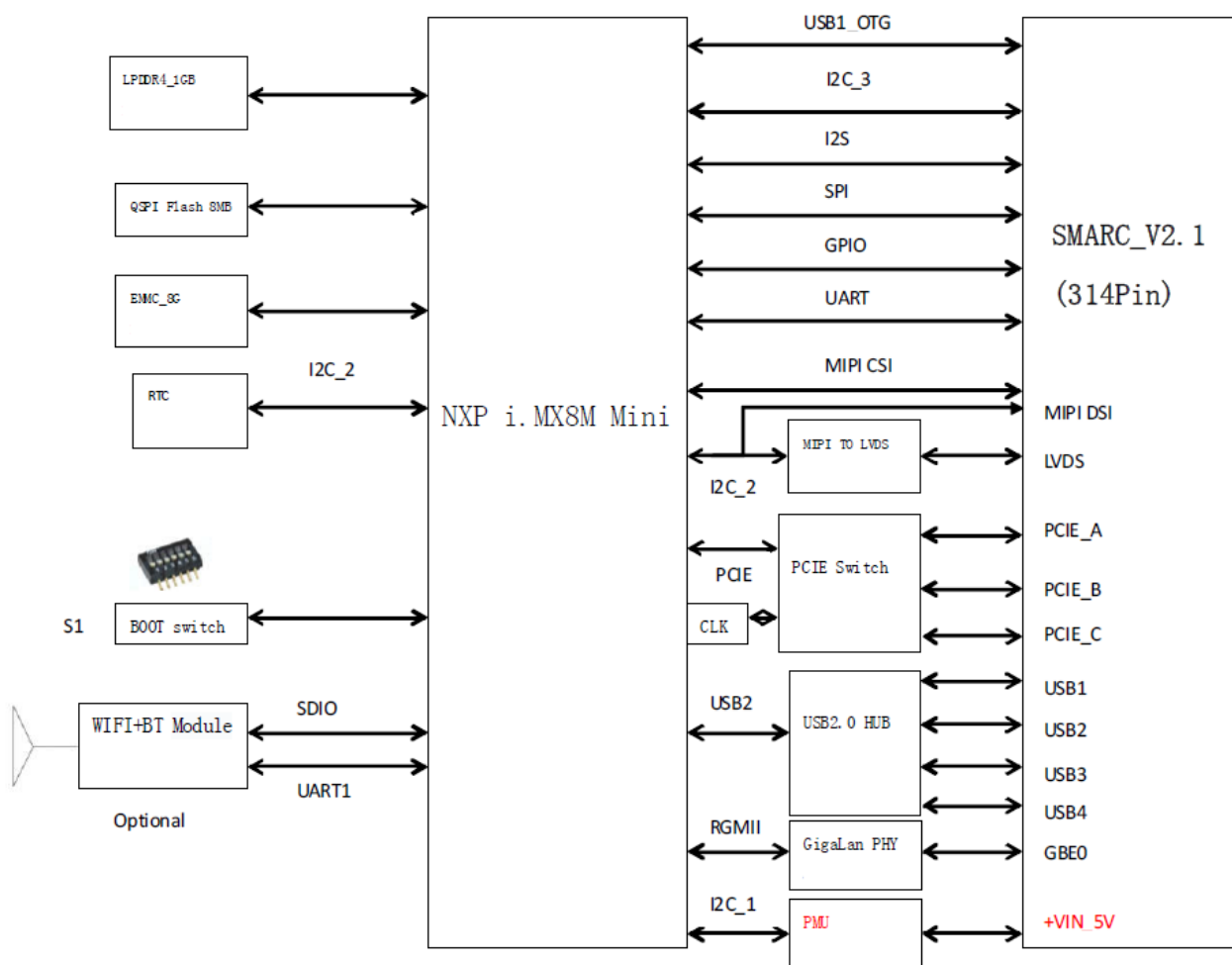
2. Acceleration Rate : 10g for operation mode
 3. Duration Time : 11ms
 4. No. of Shock : Z axis 1000 times
 5. Test Axis: Z axis
 6. Operation mode
 7. Reference IEC 60068-2-29 Testing procedures
- Test Eb : Bump Test



Note: Specifications are subject to change without notice.

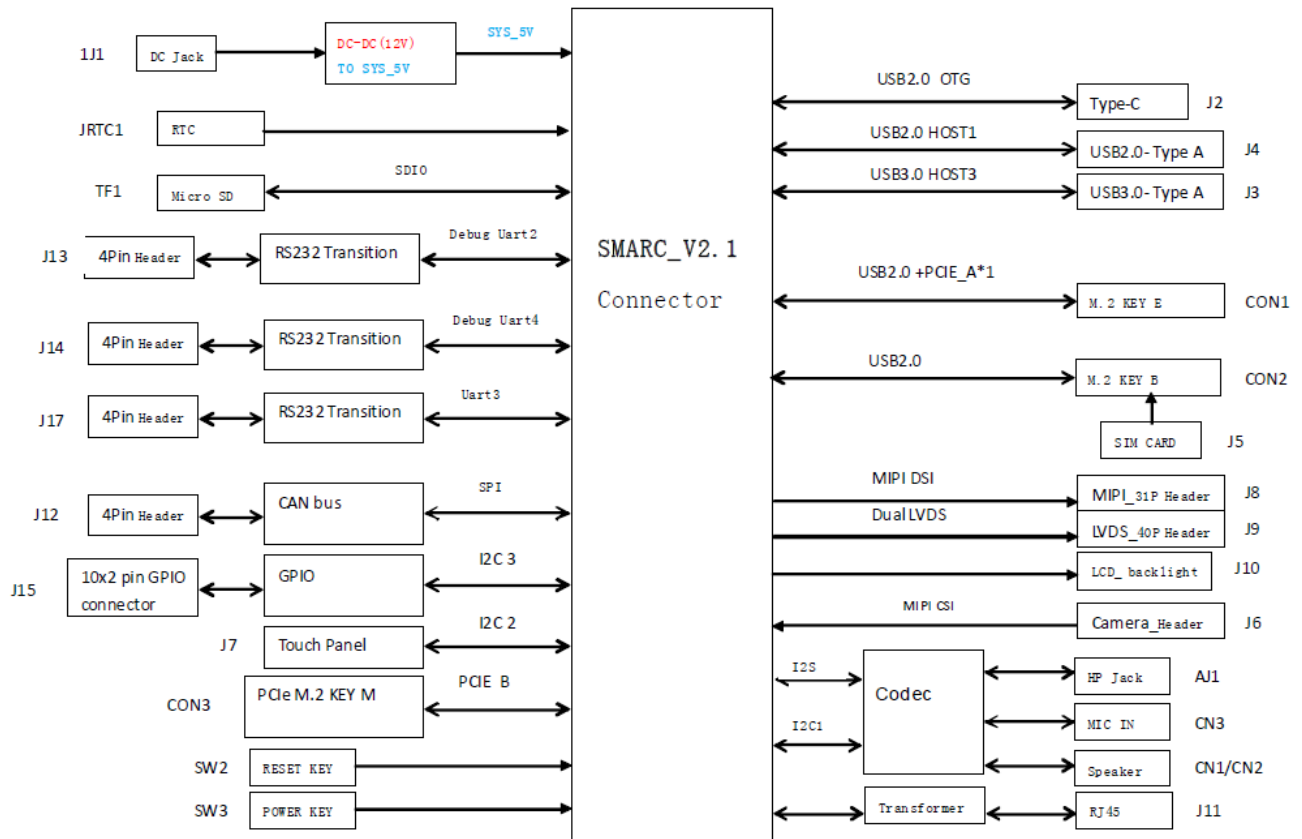
1.6 Architecture Overview—Block Diagram

The following block diagram shows the architecture and main components of SMA-X8I.



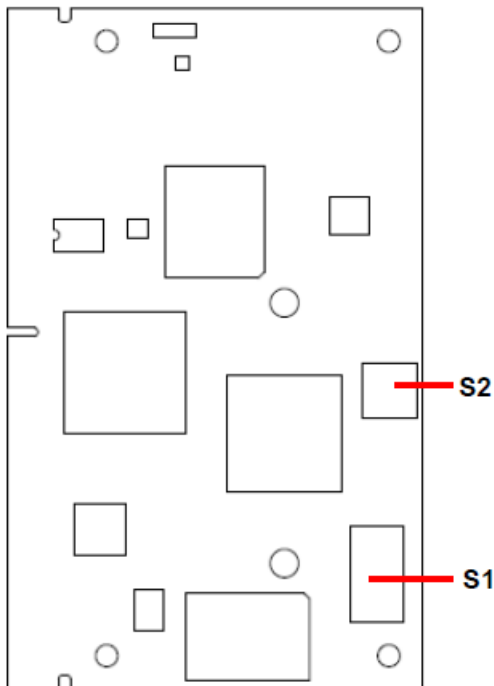
SMA-X8I, REV-SA03 User's Manual

The following block diagram shows the architecture and main components of REV-SA03.



2. Hardware Configuration

2.1 SMA-X8I Product Overview



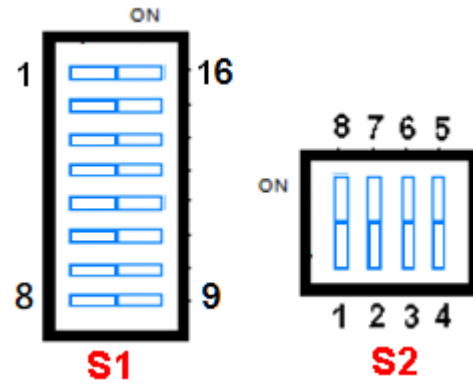
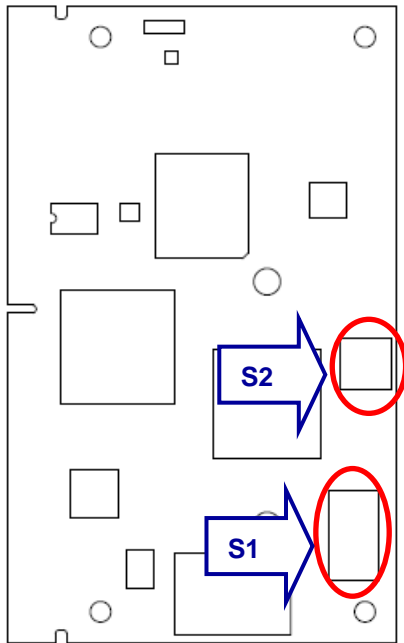
2.2 SMA-X8I Jumper List

The following tables list the function of each of the board's connectors.

Jumpers		
Label	Function	Note
S1	Boot Mode selector 1	DIP switch 8pin
S2	Boot Mode selector 2	DIP switch 4pin

2.3 SMA-X8I Setting Jumpers

2.3.1 Boot Mode selector 1/2 (S1/S2)

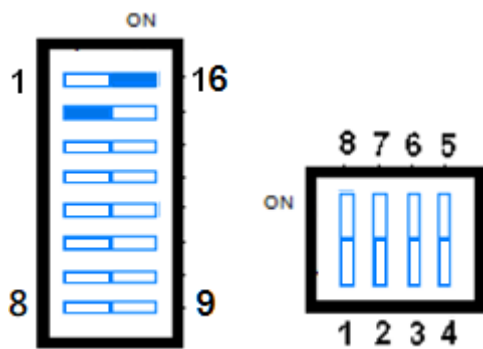


Programming mode

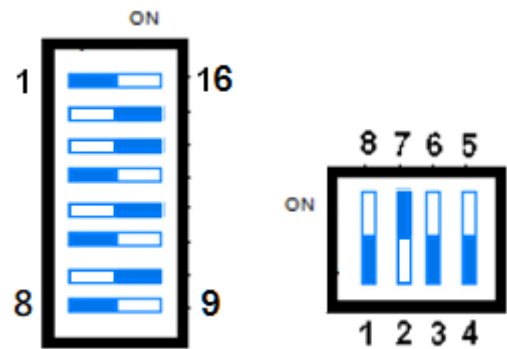
S1: 10XXXXXX S2: XXXX

X=don't care

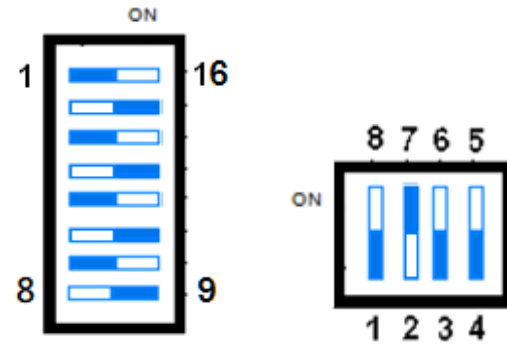
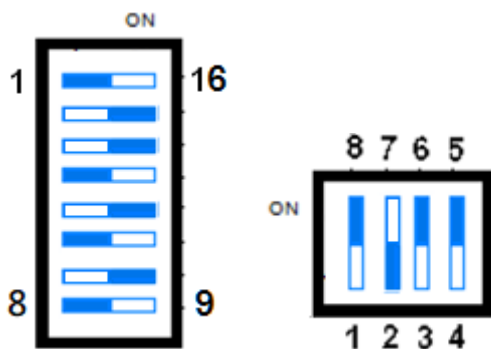
eMMC boot



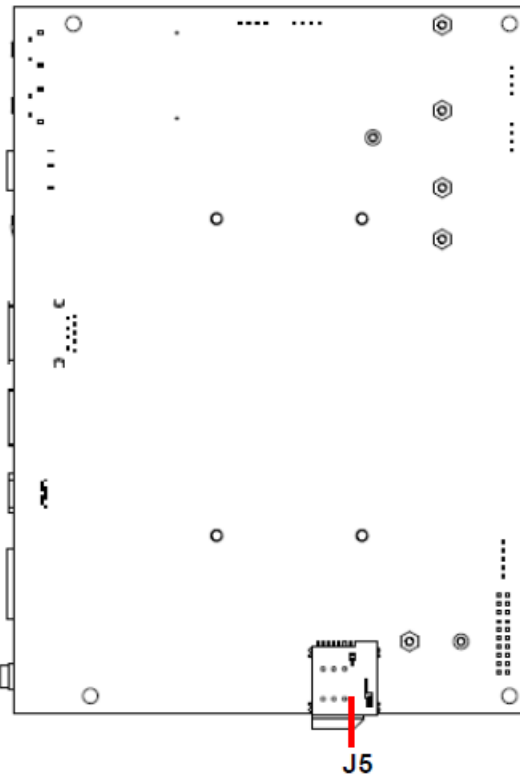
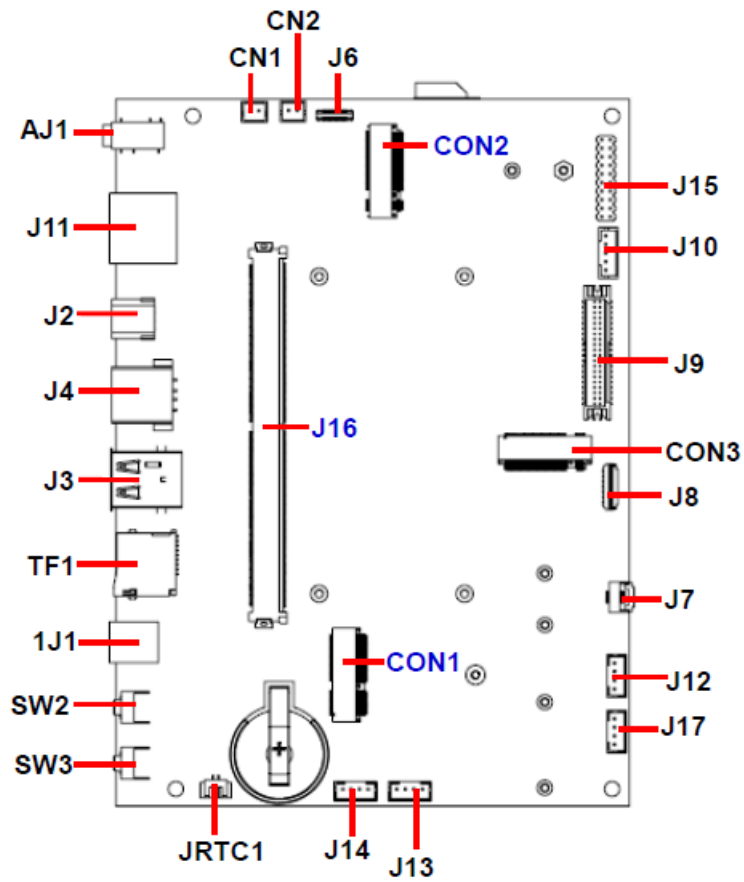
SPI boot



SD boot



2.4 REV-SA03 Product Overview



2.5 REV-SA03 Connector List

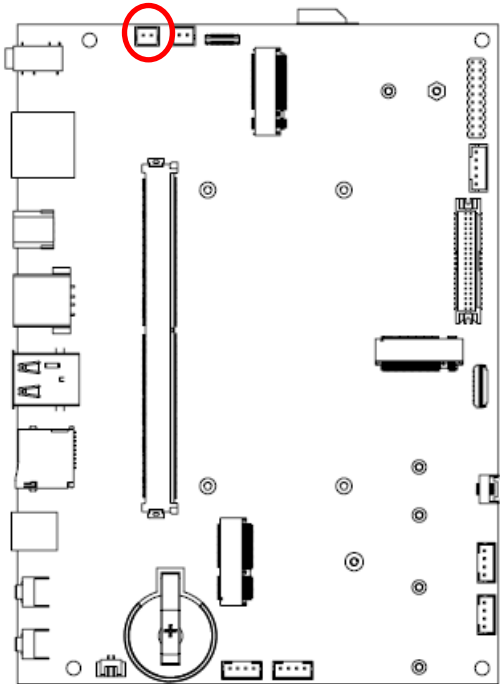
The following tables list the function of each of the board's connectors.

Connectors

Label	Function	Note
CN1	Speaker L connector	2 x 1 wafer, pitch 2.00mm
CN2	Speaker R connector	2 x 1 wafer, pitch 2.00mm
J6	MIPI CSI Screen connector	2 x 15 wafer, pitch 2.00mm
J15	General purpose I/O connector	10 x 2 header, pitch 2.00mm
J10	LCD backlight connector	5 x 1 wafer, pitch 2.00mm
J9	LVDS connector	DIN 40-pin wafer, pitch 1.25mm Matching Connector: Hirose DF13-40DS-1.25C
CON1	M.2 Key E for WIFI /BT	
CON2	M.2 Key B for LTE	
CON3	PCIe M.2 KEY M for Storage	
J8	MIPI LCD connector	31 x 1 wafer, pitch 0.30mm
J7	Touch Panel connector	6 x 1 wafer, pitch 0.50mm
J12	CAN Bus connector	4 x 1 wafer, pitch 2.00mm
J17	UART3 connector	4 x 1 wafer, pitch 2.00mm
J13	A53 Core Debug connector (UART)	4 x 1 wafer, pitch 2.00mm
J14	M4 Core Debug connector (UART)	4 x 1 wafer, pitch 2.00 mm
JRTC1	RTC connector	2 x 1 wafer, pitch 1.25mm
SW2	RESET KEY	
SW3	POWER KEY	
1J1	DC Jack connector	
TF1	Micro SD slot	
J3	USB3.0-Type A connector	
J4	USB2.0-Type A connector	
J2	USB2.0-Type C connector	
J11	RJ-45 Ethernet	
AJ1	HP Jack connector	
J16	SMARC connector	
J5	SIM Card slot	

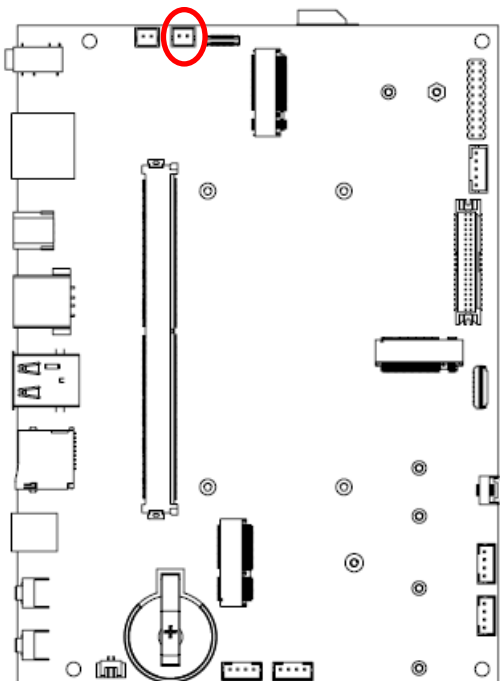
2.6 REV-SA03 Setting Connectors

2.6.1 Speaker L connector (CN1)



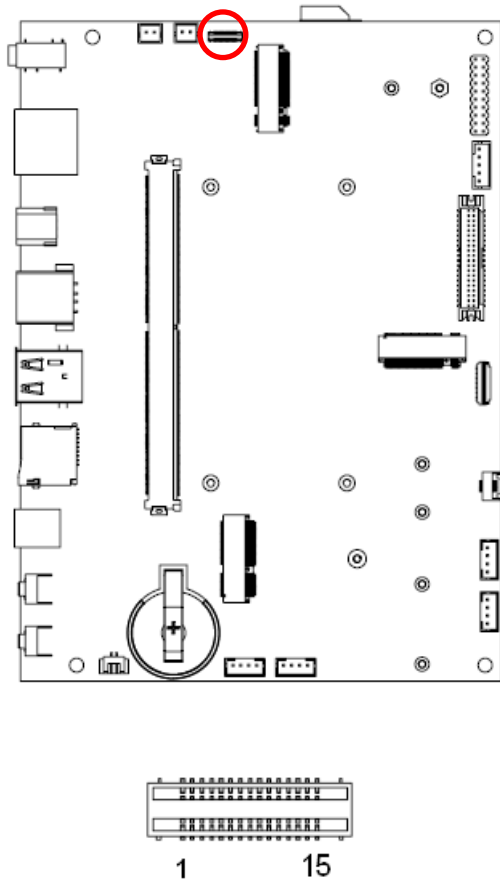
Signal	PIN
SPK_L+	1
SPK_L-	2

2.6.2 Speaker R connector (CN2)



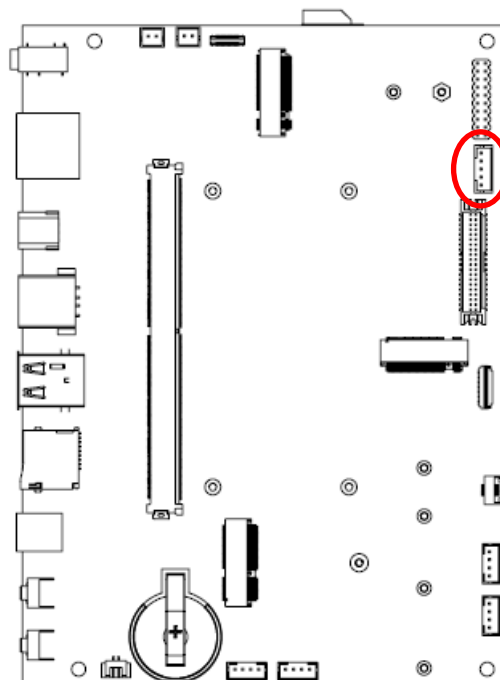
Signal	PIN
SPK_R+	1
SPK_R-	2

2.6.3 MIPI CSI Screen connector (J6)



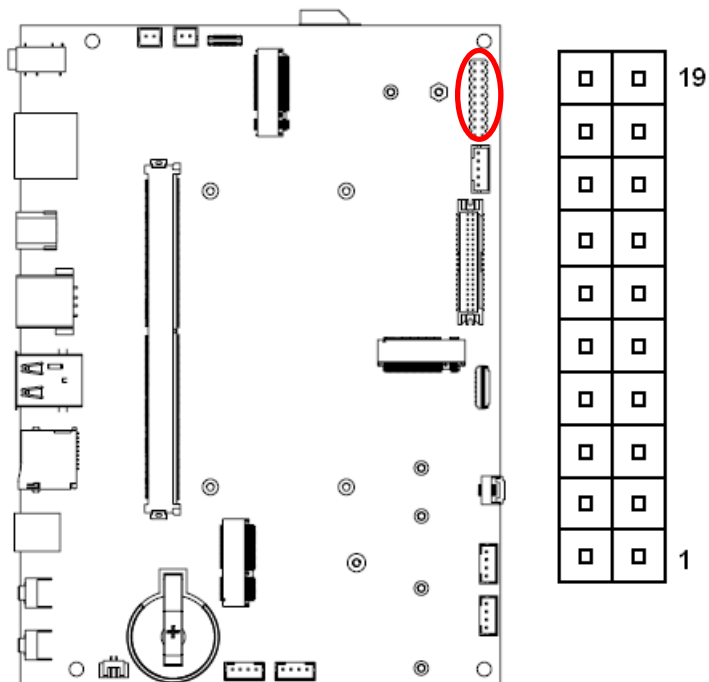
Signal	PIN	PIN	Signal
GND	1	30	MIPI_CSI_CLKN
MIPI_CSI_D0P	2	29	MIPI_CSI_CLKP
MIPI_CSI_D0N	3	28	GND
GND	4	27	MIPI_CSI_D1P
MIPI_CSI_D2P	5	26	MIPI_CSI_D1N
MIPI_CSI_D2N	6	25	GND
GND	7	24	VCC18_DVP
MIPI_CSI_D3P	8	23	GND
MIPI_CSI_D3N	9	22	VCC1.5_DVP
GND	10	21	CSI_SDA
CSI_MCLK0	11	20	CSI_SCL
CSI_RST	12	19	GND
GND	13	18	VCC28_DVP
CSI_PWDN	14	17	AVDD28_DVP
GND	15	16	GND

2.6.4 LCD Backlight connector (J10)



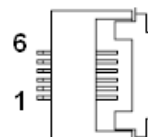
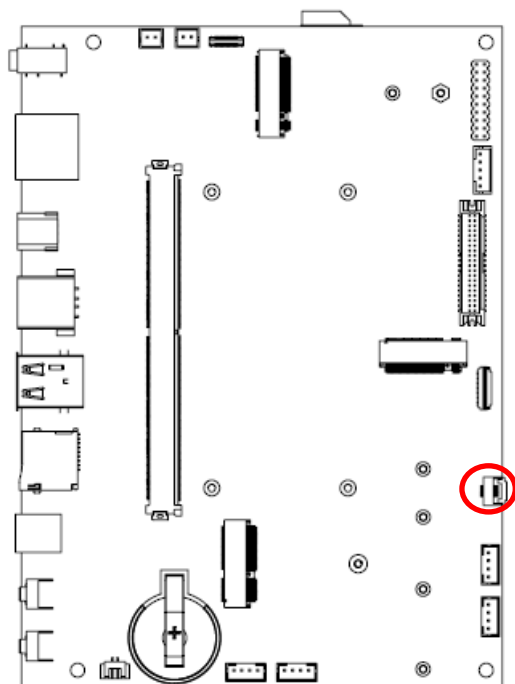
Signal	PIN
LCD_5V	5
LCD0_BL_PWM	4
LCD0_BL_EN	3
GND	2
LCD_12V	1

2.6.5 General purpose I/O connector (J15)



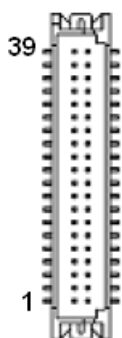
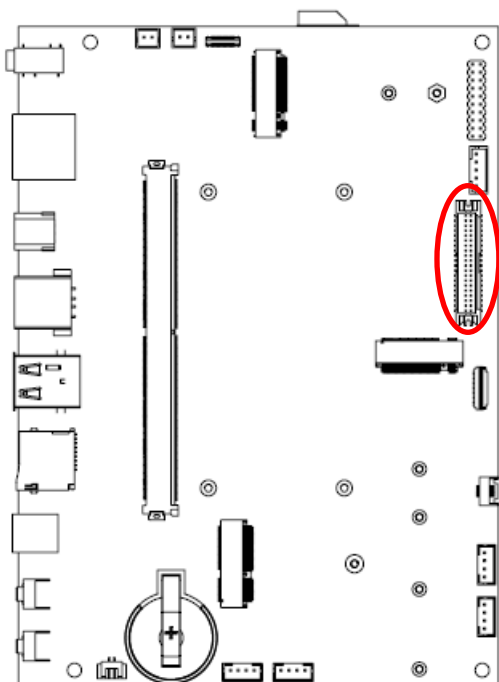
Signal	PIN	PIN	Signal
VIO_3V3	20	19	GND
DIO_I2C_SDA	18	17	DIO_I2C_SCL
DO_7	16	15	DI_7
DO_6	14	13	DI_6
DO_5	12	11	DI_5
DO_4	10	9	DI_4
DO_3	8	7	DI_3
DO_2	6	5	DI_2
DO_1	4	3	DI_1
DO_0	2	1	DI_0

2.6.6 Touch Panel connector (J7)



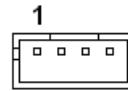
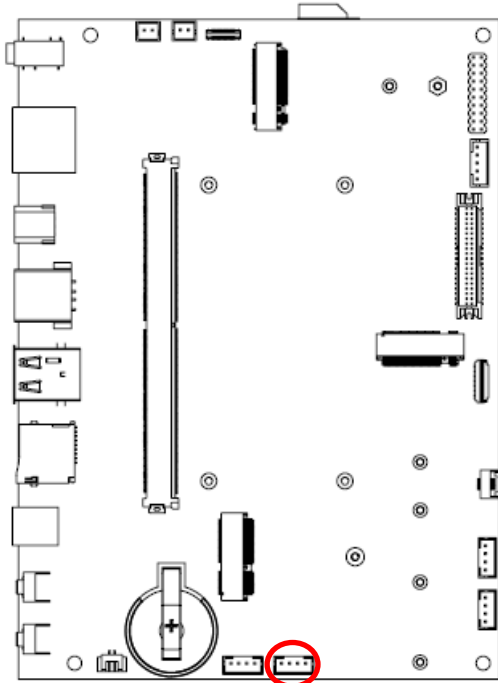
Signal	PIN
TP_RST	6
TP_SDA	5
TP_SCL	4
TP_INT	3
GND	2
VCC_3V3	1

2.6.7 LVDS connector (J9)



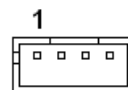
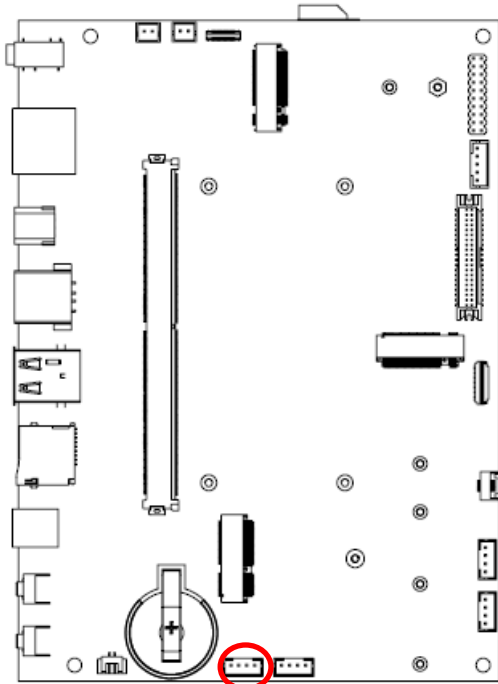
Signal	PIN	PIN	Signal
+12V	39	40	+12V
GND	37	38	GND
LBCN_D8	35	36	D_LACN_D17
LBCP_D7	33	34	D_LACP_D16
GND	31	32	GND
LB3N_D6	29	30	LB2N_D9
LB3P_D5	27	28	LB2P_DCK
GND	25	26	GND
LB1N_D11	23	24	LB0N_D13
LB1P_D10	21	22	LB0P_D12
GND	19	20	GND
D_LA3N_D15	17	18	D_LA2N_D19
D_LA3P_D14	15	16	D_LA2P_D18
GND	13	14	GND
D_LA1N_D21	11	12	D_LA0N_D23
D_LA1P_D20	9	10	D_LA0P_D22
GND	7	8	GND
LVDS_DDC_CLK	5	6	LVDS_DDC_DAT
+3.3V	3	4	+5V
+3.3V	1	2	+5V

2.6.8 A53 Core Debug connector (UART) (J13)



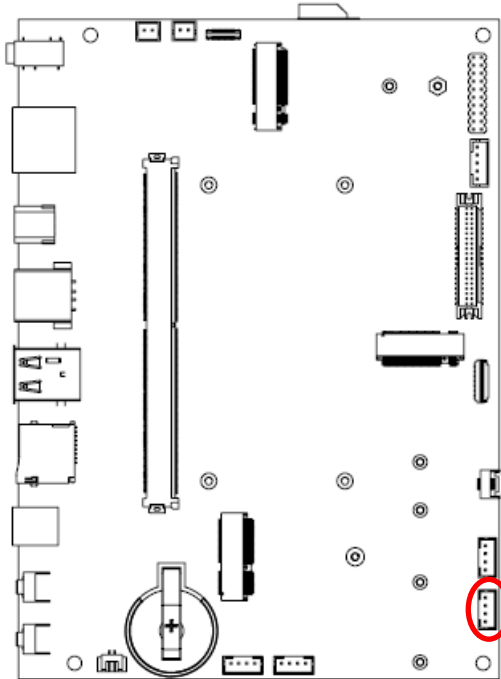
Signal	PIN
UART2_RS232_RX	1
GND	2
UART2_RS232_TX	3
VCC_3V3	4

2.6.9 M4 Core Debug connector (UART) (J14)



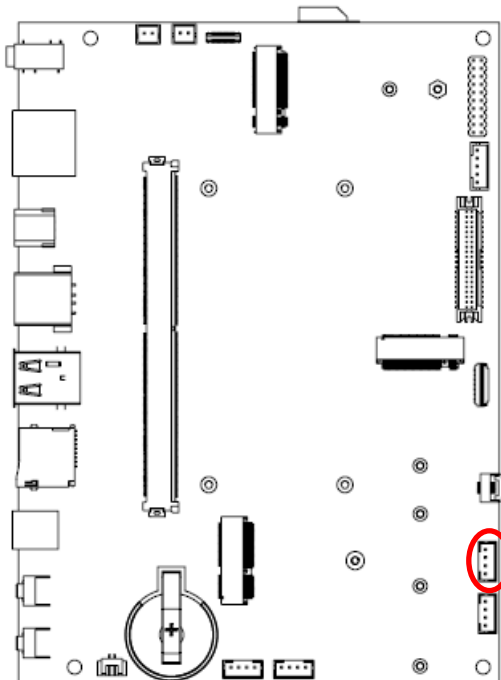
Signal	PIN
UART4_RS232_RX	1
GND	2
UART4_RS232_TX	3
VCC_3V3	4

2.6.10 UART3 connector (J17)



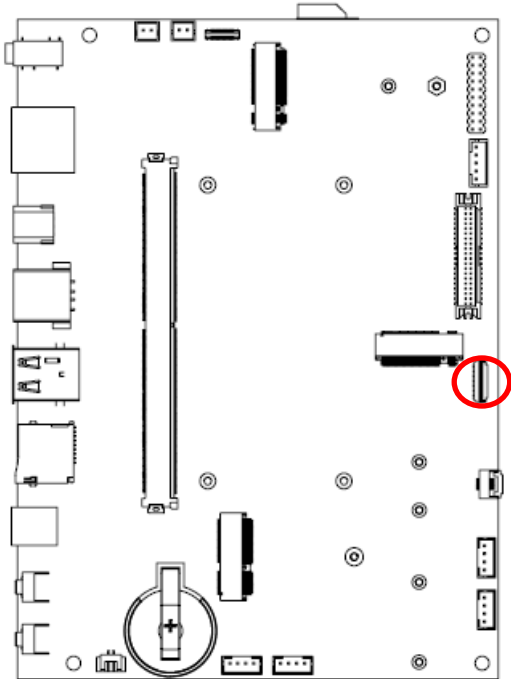
Signal	PIN
VCC_3V3	4
UART3_RS232_TX	3
GND	2
UART3_RS232_RX	1

2.6.11 CAN Bus connector (J12)



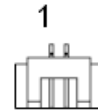
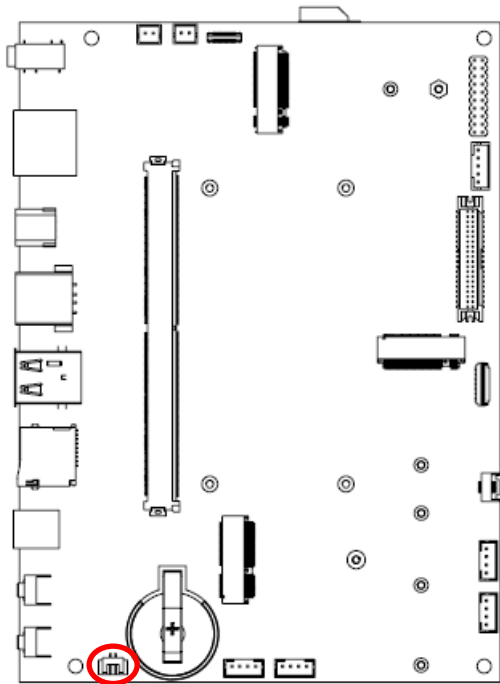
Signal	PIN
GND	4
CAN_L	3
GND	2
CAN_H	1

2.6.12 MIPI LCD connector (J8)



Signal	PIN
LEDA	31
LEDA	30
NC	29
LEDK	28
LEDK	27
LEDK	26
NC	25
GND	24
LA3N_D15	23
LA0N_D23	22
LA3P_D14	21
LA0P_D22	20
GND	19
GND	18
LACN_D17	17
LA1N_D21	16
LACP_D16	15
LA1P_D20	14
GND	13
GND	12
LA2N_D19	11
NC	10
LA2P_D18	9
NC	8
NC	7
C_GPIO8	6
LCD_1V8	5
LCD_1V8	4
LCD_3V3	3
LCD_3V3	2
LCD_3V3	1

2.6.13 RTC connector (JRRTC1)

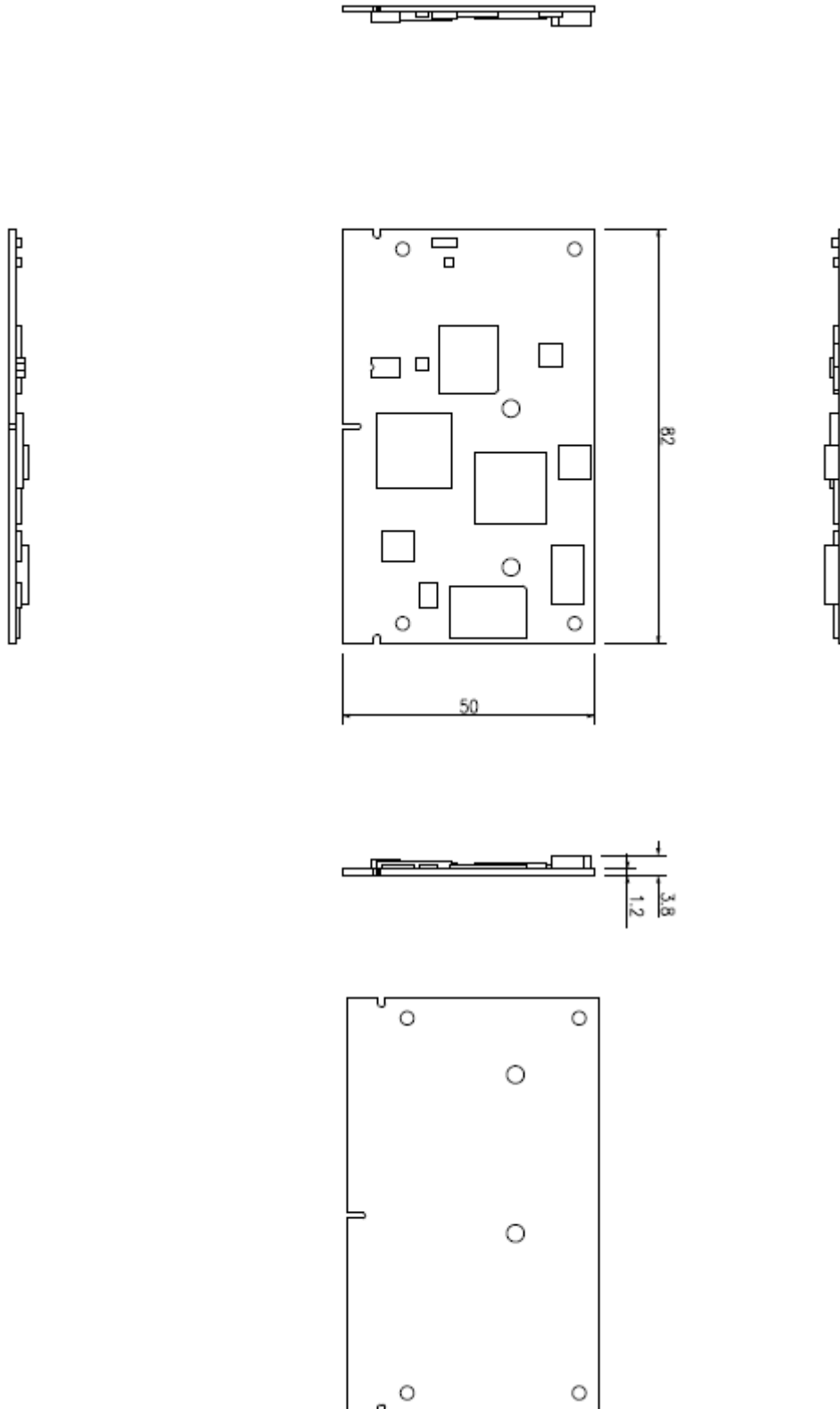


Signal	PIN
VDD_RTC	1
GND	2

3. Mechanical Drawing



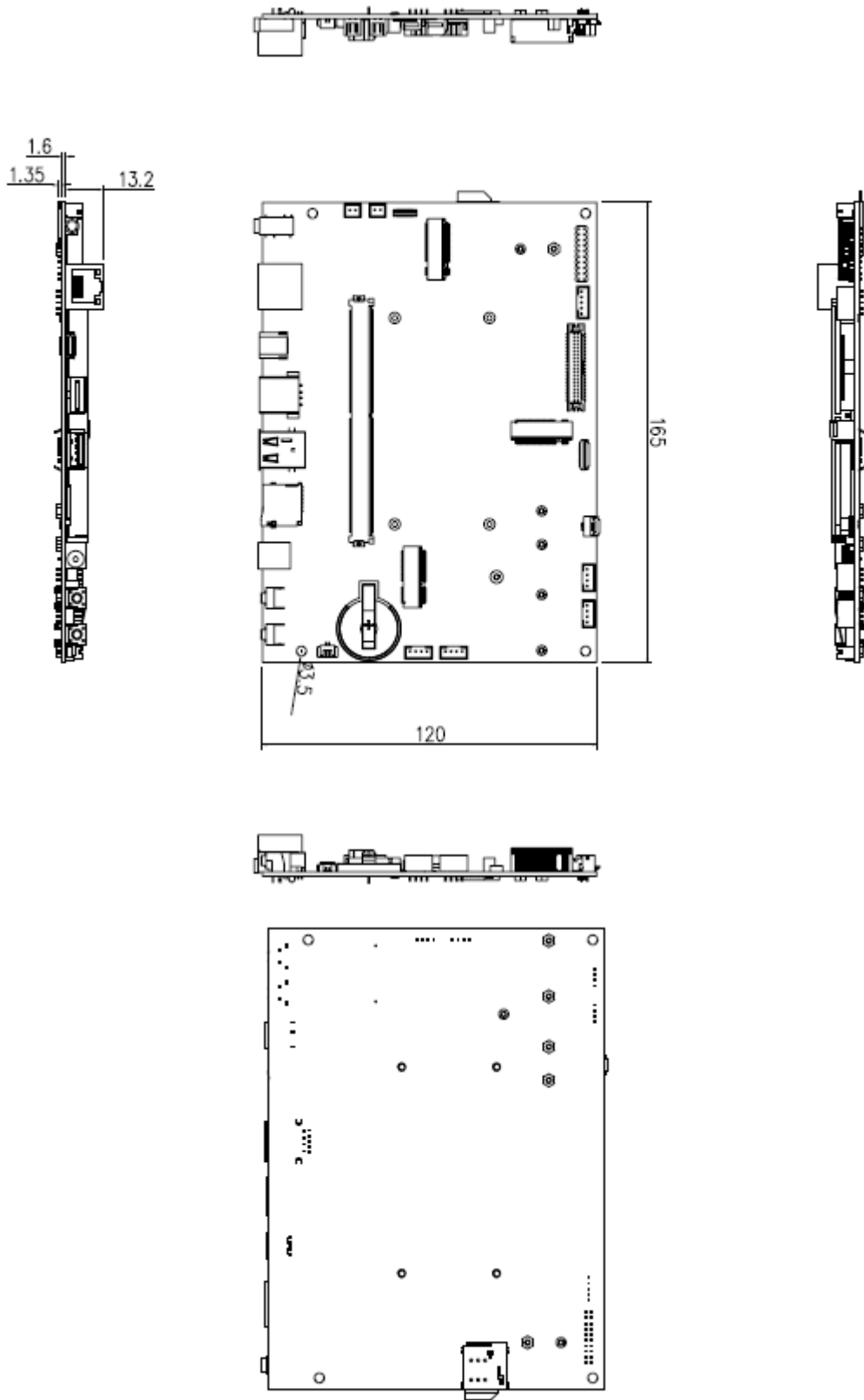
SMA-X8I



Unit: mm

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REV-SA03



Unit: mm

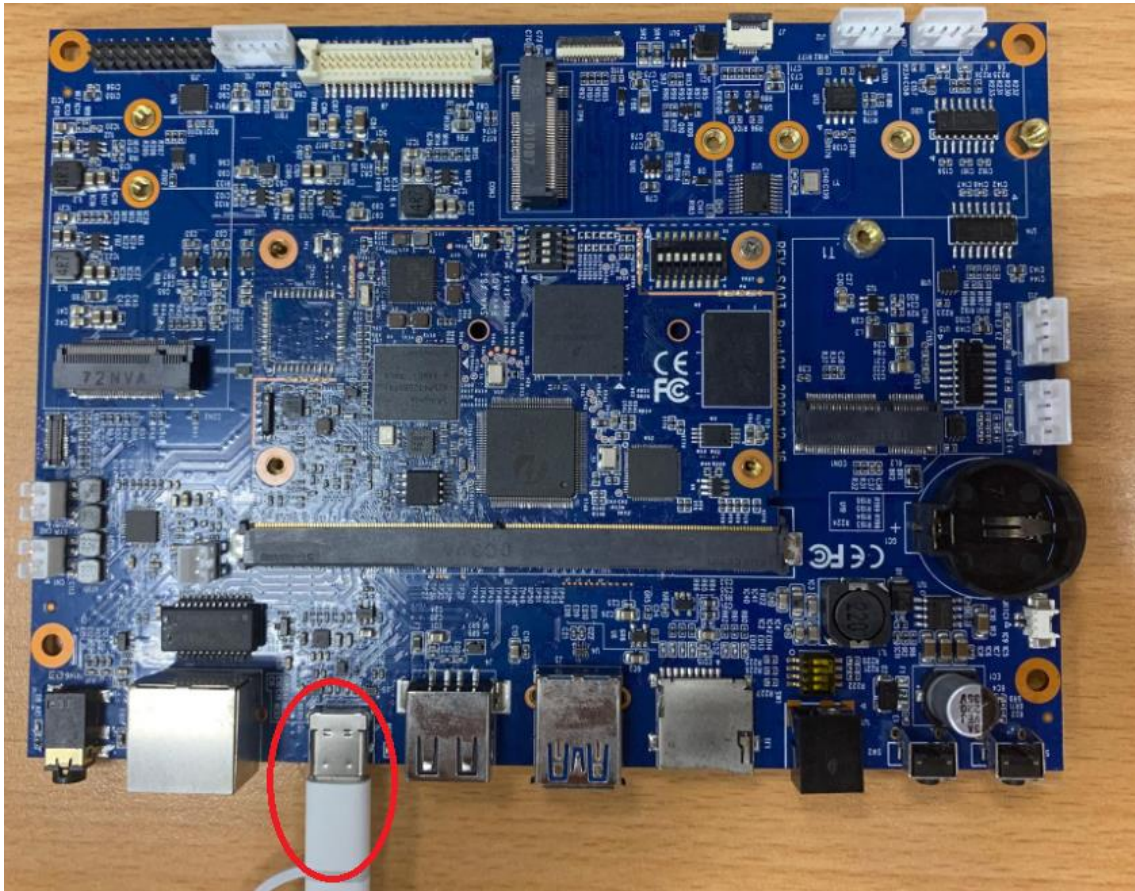
4. Linux User Guide

(Using with carrier board REV-SA03)



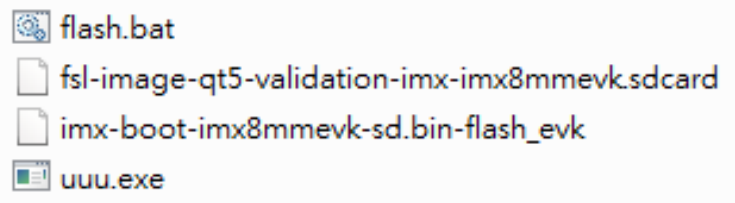
4.1 Flash Yocto 2.5 to SMA-X8I

1. Connect your SMA-X8I with REV-SA03 to computer via type C USB cable.

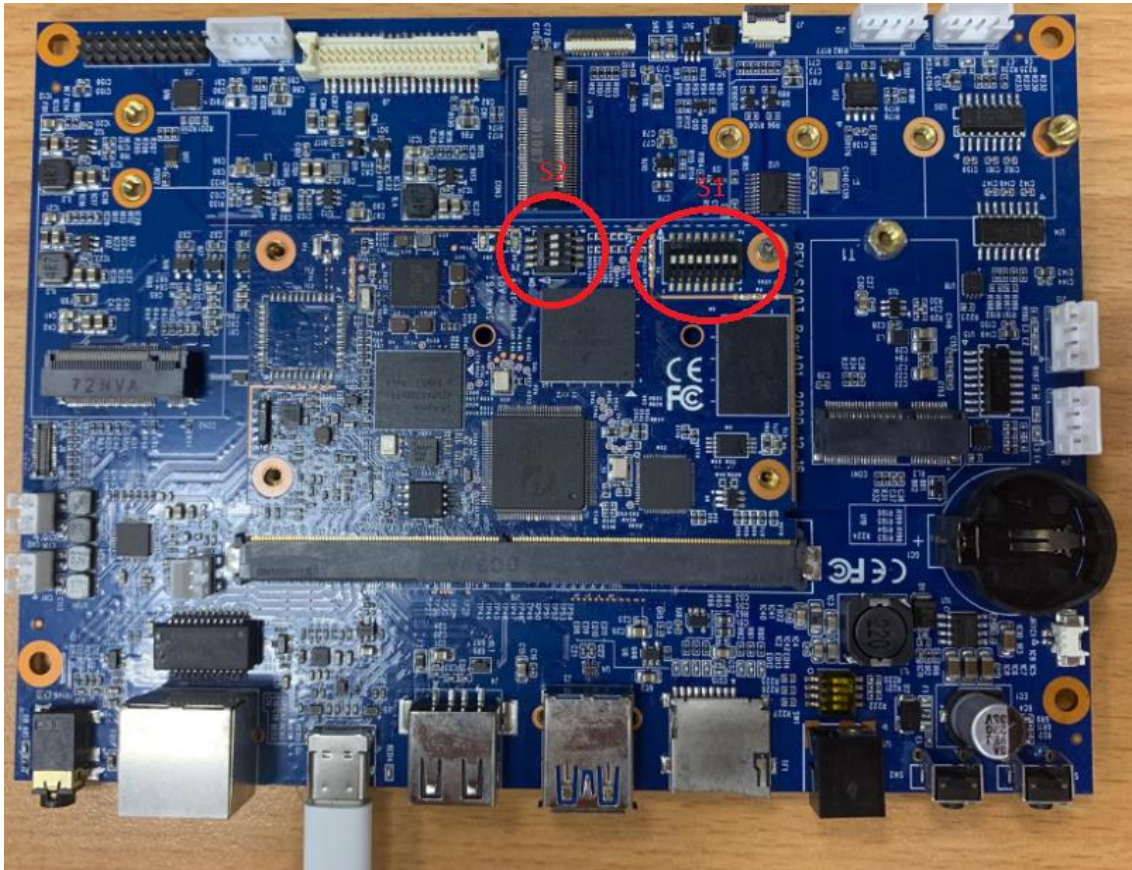


2. Download Yocto 2.5 image.

Please connect Avalue FAE to get download link.

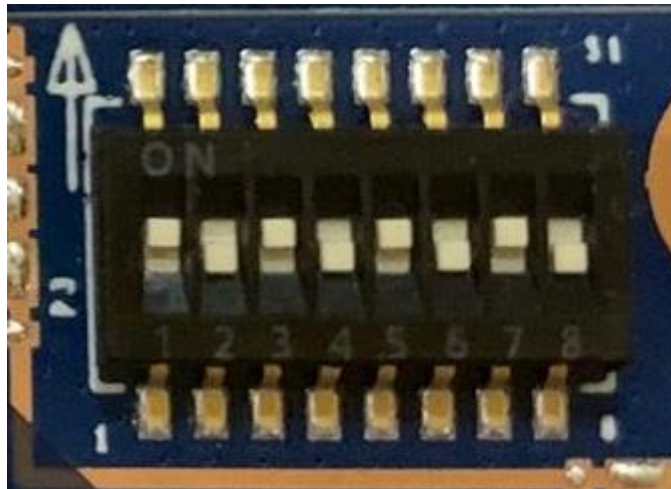


3. Set the jumper to OTG mode.



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S1: Set to 10101010



S2: Set to 0100



4. Connect 12V power supplier to power on the device.

Execute "flash.bat" start to flash image.

```
D:\sma-x8i>uuu.exe -b emmc_all imx-boot-imx8mmevk-sd.bin-flash_evk fsl-image-qt5
-validation-imx-imx8mmevk.sdcard
uuu <Universal Update Utility> for nxp imx chips -- libuuu_1.2.91-0-g3799f4d

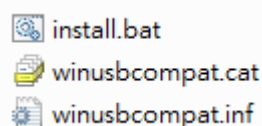
Your console don't support UT mode, fail back to verbose mode
Build in config:
  Pctl      Chip      Uid      Pid      BcdVersion
  =====
SDPS:      MX8QXP      0x1fc9   0x012f   [0x0002..0xffff]
SDPS:      MX8QM      0x1fc9   0x0129   [0x0002..0xffff]
SDP:       MX7D       0x15a2   0x0076
SDP:       MX6Q       0x15a2   0x0054
SDP:       MX6D       0x15a2   0x0061
SDP:       MX6SL      0x15a2   0x0063
SDP:       MX6SX      0x15a2   0x0071
SDP:       MX6UL      0x15a2   0x007d
SDP:       MX6ULL     0x15a2   0x0080
SDP:       MX6SLL     0x1fc9   0x0128
SDP:       MX7ULP     0x1fc9   0x0126
SDP:       MXRT106X   0x1fc9   0x0135
SDP:       MX8MM      0x1fc9   0x0134
SDP:       MX8MQ      0x1fc9   0x012b
SDPU:      SPL        0x0525   0xb4a4   [0x0000..0x04ff]
SDPU:      SPL1       0x0525   0xb4a4   [0x0500..0x9998]
SDPU:      SPL        0x0525   0xb4a4   [0x9999..0x9999]
FBK:       0x066f     0x9afe
FBK:       0x066f     0x9bff
FB:        0x0525     0xa4a5
FB:        0x18d1     0x0d02
```

```
100x3:9>okay200
3:9>Start Cmd:FB: flash bootloader imx-boot-imx8mmevk-sd.bin-flash_evk
0x400000000x2003:9>okay
3:9>Start Cmd:FB: ucmd if env exists emmc_ack; then ; else setenv emmc_ack 0; fi
;
3:9>okay
3:9>Start Cmd:FB: ucmd mmc partconf ${emmc_dev} ${emmc_ack} 1 0
3:9>okay
3:9>Start Cmd:FB: done
3:9>okay
←[?25h
```

5. In case that the following situation happens, it needs to install the drvier to SMA-I8X in Windows 7.

(skip step 5 if this pronlem does not occur in your device)

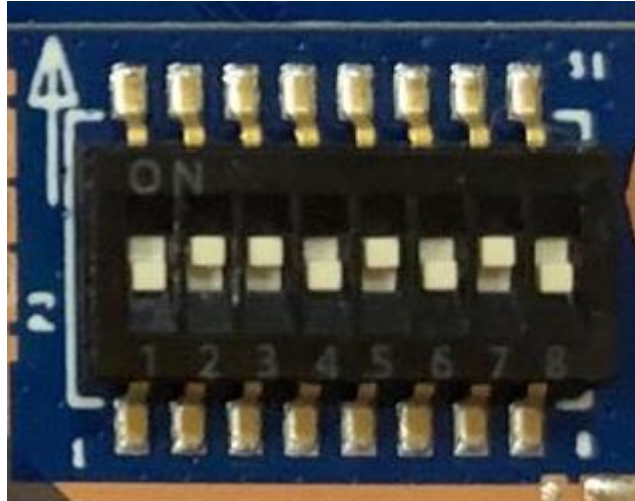
- Download [this package](#).
- Unzip the directory downloaded.
- Run "install.bat" as Administrator.



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6. After flash image finish, disable power supplier.
7. Set the jumper to boot mode.

S1:01101010



S2:0100



8. Power on and start to boot to Yocto 2.5.

