

SMA-IMX6-E1

SAMRC Module

User's Manual

1st Ed – 24 August 2023

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-IMX6-E1



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

1.3 Document Amendment History

Revision	Date	By	Comment
1st	August 2023	Avalue	Initial Release

1.4 Manual Objectives

This manual describes in details Avalue Technology SMA-IMX6-E1 Single Board.

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-IMX6-E1 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.

Please be aware that it is possible to create configurations within the CMOS RAM that make booting impossible. If this should happen, clear the CMOS settings, (see the description of the Jumper Settings for details).

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

System	
CPU	Freescale i.MX6 Cortex-A9 Quad/Dual CPU
System Chipset	Freescale i.MX6 Cortex-A9 Quad/Dual CPU
System Memory	2GB DRAM DDR3 (Option or 1GB)
SSD	eMMC: 8GB
PCI Express / PCI support	PCIE Gen2 Packet Switch (Option)
Power Management	NXP MMPF0100F0AEP QFN-56(8x8) SMD 14ch
Serial	2 x RX/TX (Ser0/2) (RTS/CTS share with GPIO)
FRAM	32Kb I2C FRAM
SATA	SATA
Edge I/O	
USB	1 x USB 2.0, 1 x USB OTG
Interface	12 x GPIO, 2 x SDIO, 4 x I ² C, 3 x I ² S (one share with PCAM), 2 x SPI, SPDIF, WDT, 2 x CAN
Ethernet Interface	10/100/1000 MBit Ethernet (RGMII Microchip_KSZ9031RNXIC)
Display Specification	
Chipset	Freescale i.MX6 Cortex-A9 Quad/Dual CPU
Resolution	One Parallel 24-bit display port, up to 225 Mpixels/sec (for example, WUXGA at 60 Hz or dual HD1080 and WXGA at 60 Hz)
HDMI	HDMI 1.4 port
LCD Interface	LVDS serial ports—One port up to 165 Mpixels/sec
Ethernet Specification	
Ethernet Interface	10/100/1000 MBit Ethernet (Microchip KSZ9031RNXIC QFN-48(7 x 7) SMD)
Mechanical & Environmental Specification	
Power Requirement	+3.0V ~ 5.25V Allows operation from 3.6V nominal Allows operation from 3.3V fixed DC supply Allows operation from 5.0V fixed DC supply Single supply (no separate standby voltage) Module power pins allow 5A max, or 15W max input power at 3.0V 3.3V default I/O voltage

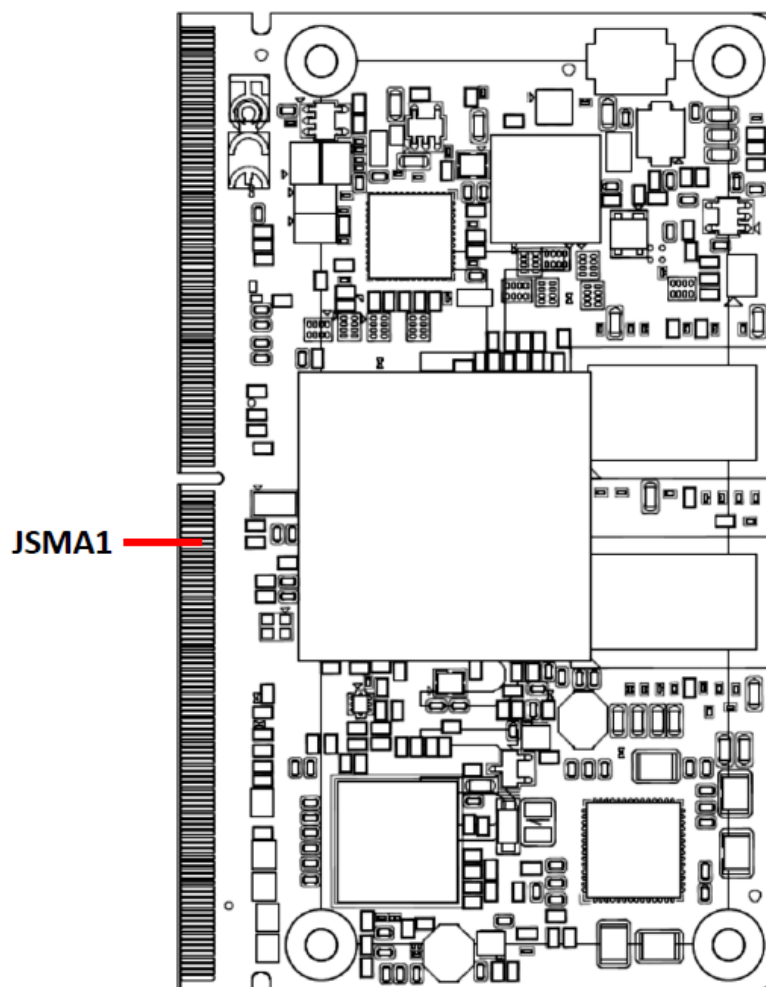
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Power Type	314 pin 0.5mm pitch R/A memory socket style connector (MXM3)
Operating Temp.	-40 ~ 85°C
Storage Temp.	-40 ~ 85°C
Operating Humidity	93% relative Humidity at 40°C, non-condensing (according to IEC 60068-2-78)
Size (L x W) (Please consult 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 without heat sink
Vibration Test	Random Vibration Operation 1 Test PSD: 0.00454G ² /Hz, 1.5 Grms 2 System condition: operation mode 3 Test frequency: 5~500 Hz 4 Test axis: X,Y and Z axis 5 Test time: 30 minutes per each axis 6 IEC60068-2-64 Test Fh 6 Storage: mSATA Random vibration test (Non-operation) 1 PSD: 0.01818G ² /Hz, 3.0 Grms 2 Non-Operation mode 3 Test Frequency: 5-500Hz 4 Test Axis: X, Y and Z axis 5 30 min. per each axis 6 IEC 60068-2-64 Test: Fh Package Vibration Test: 1 Test PSD: 0.026G ² /Hz, 2.16 Grms 2 Test frequency: 5~500 Hz 3 Test axis: X,Y and Z axis 4 Test time: 30 minutes per each axis 5 IEC 60068-2-64 Test Fh
Shock Test	1 Wave from: Half Sine wave 2 Acceleration Rate: 10g 3 Duration Time: 11ms 4 No. of shock: Z axis 300 times 5 Test Axis: Z axis 6 operation mode 7 Reference IEC 60068-2-27 testing procedures Test Eb: Shock Test

Drop Test	Package drop test Reference ISTA 2A, Method: IEC-60068-2-32 Test: Ed Test Ea: Drop Test 1 Test phase: One corner, three edges, six faces 2 Test high: 96.5cm 3 Package weight: 5Kg 4 Test drawing
OS Support (listed in accordance with Intel document)	Yocto 2.1 (Use Yocto to verify the function when testing)

2. Hardware Configuration

2.1 Product Overview



2.2 Connector List

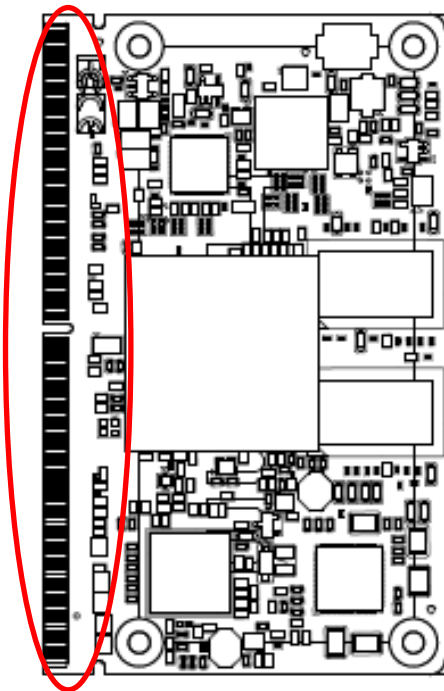
The following tables list the function of each of the board's connectors.

Connectors

Label	Function	Note
JSMA1	iMX6 connector	

2.3 Setting Connectors

2.3.1 iMX6 connector (JSMA1)



*Default

Signal	PIN	PIN	Signal
		S1	PCAM_VSYNC
PCAM_PXL_CK1	P1	S2	PCAM_HSYNC
GND	P2	S3	GND
PCAM_D0	P3	S4	PCAM_PXL_CK0
PCAM_D1	P4	S5	I2C_CAM_CK
PCAM_DE	P5	S6	CAM_MCK
PCAM_MCK	P6	S7	I2C_CAM_DAT
PCAM_D2	P7	S8	CSI0_CK+
PCAM_D3	P8	S9	CSI0_CK-
GND	P9	S10	GND
PCAM_D4	P10	S11	CSI0_D0+
PCAM_D5	P11	S12	CSI0_D0-
GND	P12	S13	GND
PCAM_D6	P13	S14	CSI0_D1+
PCAM_D7	P14	S15	CSI0_D1-
GND	P15	S16	GND
NC	P16	S17	MLB_CLK
NC	P17	S18	MLB_DAT
GND	P18	S19	MLB_SIG

Signal	PIN	PIN	Signal
GBE_MDI3-	P19	S20	NC
GBE_MDI3+	P20	S21	NC
GBE_LINK100#	P21	S22	NC
GBE_LINK1000#	P22	S23	AFB6_PTIO
GBE_MDI2-	P23	S24	AFB7_PTIO
GBE_MDI2+	P24	S25	GND
GBE_LINK_ACT#	P25	S26	SDMMC_D0
GBE_MDI1-	P26	S27	SDMMC_D1
GBE_MDI1+	P27	S28	SDMMC_D2
GBE_CTREF	P28	S29	SDMMC_D3
GBE_MDI0-	P29	S30	SDMMC_D4
GBE_MDI0+	P30	S31	SDMMC_D5
SPI0_CS1#	P31	S32	SDMMC_D6
GND	P32	S33	SDMMC_D7
SDIO_WP	P33	S34	GND
SDIO_CMD	P34	S35	SDMMC_CK
SDIO_CD#	P35	S36	SDMMC_CMD
SDIO_CK	P36	S37	SDMMC_RST#
SDIO_PWR_EN	P37	S38	AUDIO_MCK
GND	P38	S39	I2S0_LRCK
SDIO_D0	P39	S40	I2S0_SDOUT
SDIO_D1	P40	S41	I2S0_SDIN
SDIO_D2	P41	S42	I2S0_CK
SDIO_D3	P42	S43	NC
SPI0_CS0#	P43	S44	NC
SPI0_CK	P44	S45	NC
SPI0_DIN	P45	S46	NC
SPI0_DO	P46	S47	GND
GND	P47	S48	I2C_GP_CK
SATA_TX+	P48	S49	I2C_GP_DAT
SATA_TX-	P49	S50	NC
GND	P50	S51	NC
SATA_RX+	P51	S52	NC
SATA_RX-	P52	S53	NC

Signal	PIN	PIN	Signal
GND	P53	S54	NC
SPI1_CS0#	P54	S55	AFB8_PTIO
SPI1_CS1#	P55	S56	AFB9_PTIO
SPI1_CK	P56	S57	NC
SPI1_DIN	P57	S58	PCAM_ON_CSI1#
SPI1_DO	P58	S59	SPDIF_OUT
GND	P59	S60	SPDIF_IN
USB0+	P60	S61	GND
USB0-	P61	S62	NC
USB0_EN_OC#	P62	S63	NC
NC	P63	S64	GND
USB0_OTG_ID	P64	S65	NC
USB1+	P65	S66	NC
USB1-	P66	S67	GND
USB1_EN_OC#	P67	S68	AFB_DIFF2+
GND	P68	S69	AFB_DIFF2-
NC	P69	S70	GND
NC	P70	S71	AFB_DIFF3+
USB2_EN_OC#	P71	S72	AFB_DIFF3-
PCIE_C_PRSENT#	P72	S73	GND
PCIE_B_PRSENT#	P73	S74	AFB_DIFF4+
PCIE_A_PRSENT#	P74	S75	AFB_DIFF4-
<Key>			<Key>
PCIE_A_RST#	P75	S76	PCIE_B_RST#
PCIE_C_CKREQ#	P76	S77	PCIE_C_RST#
PCIE_B_CKREQ#	P77	S78	PCIE_C_RX+
PCIE_A_CKREQ#	P78	S79	PCIE_C_RX-
GND	P79	S80	GND
PCIE_C_REFCK+	P80	S81	PCIE_C_TX+
PCIE_C_REFCK-	P81	S82	PCIE_C_TX-
GND	P82	S83	GND

Signal	PIN	PIN	Signal
PCIE_A_REFCK+	P83	S84	PCIE_B_REFCK+
PCIE_A_REFCK-	P84	S85	PCIE_B_REFCK-
GND	P85	S86	GND
PCIE_A_RX+	P86	S87	PCIE_B_RX+
PCIE_A_RX-	P87	S88	PCIE_B_RX-
GND	P88	S89	GND
PCIE_A_TX+	P89	S90	PCIE_B_TX+
PCIE_A_TX-	P90	S91	PCIE_B_TX-
GND	P91	S92	GND
HDMI_D2+	P92	S93	LCD_D0
HDMI_D2-	P93	S94	LCD_D1
GND	P94	S95	LCD_D2
HDMI_D1+	P95	S96	LCD_D3
HDMI_D1-	P96	S97	LCD_D4
GND	P97	S98	LCD_D5
HDMI_D0+	P98	S99	LCD_D6
HDMI_D0-	P99	S100	LCD_D7
GND	P100	S101	GND
HDMI_CK+	P101	S102	LCD_D8
HDMI_CK-	P102	S103	LCD_D9
GND	P103	S104	LCD_D10
HDMI_HPD	P104	S105	LCD_D11
HDMI_CTRL_CK	P105	S106	LCD_D12
HDMI_CTRL_DAT	P106	S107	LCD_D13
HDMI_CEC	P107	S108	LCD_D14
GPIO0	P108	S109	LCD_D15
GPIO1	P109	S110	GND
GPIO2	P110	S111	LCD_D16
GPIO3	P111	S112	LCD_D17
GPIO4	P112	S113	LCD_D18
GPIO5	P113	S114	LCD_D19

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Signal	PIN	PIN	Signal
GPIO6	P114	S115	LCD_D20
GPIO7	P115	S116	LCD_D21
GPIO8	P116	S117	LCD_D22
GPIO9	P117	S118	LCD_D23
GPIO10	P118	S119	GND
GPIO11	P119	S120	LCD_DE
GND	P120	S121	LCD_VS
I2C_PM_CK	P121	S122	LCD_HS
I2C_PM_DAT	P122	S123	LCD_PCK
BOOT_SEL0#	P123	S124	GND
BOOT_SEL1#	P124	S125	LVDS0+
BOOT_SEL2#	P125	S126	LVDS0-
RESET_OUT#	P126	S127	LCD_BKLT_EN
RESET_IN#	P127	S128	LVDS1+
POWER_BTN#	P128	S129	LVDS1-
SER0_TX	P129	S130	GND
SER0_RX	P130	S131	LVDS2+
SER0_RTS#	P131	S132	LVDS2-
SER0_CTS#	P132	S133	LCD_VDD_EN
GND	P133	S134	LVDS_CK+
SER1_TX	P134	S135	LVDS_CK-
SER1_RX	P135	S136	GND
SER2_TX	P136	S137	LVDS3+
SER2_RX	P137	S138	LVDS3-
SER2_RTS#	P138	S139	I2C_LCD_CK
SER2_CTS#	P139	S140	I2C_LCD_DAT
SER3_TX(option)	P140	S141	LCD_BKLT_PWM
SER3_RX(option)	P141	S142	LCD_DUAL_PCK
GND	P142	S143	GND

Signal	PIN	PIN	Signal
CAN0_TX	P143	S144	NC
CAN0_RX	P144	S145	WDT_TIME_OUT#
CAN1_TX	P145	S146	PCIE_WAKE#
CAN1_RX	P146	S147	+VDD_RTC
+VDD_IN	P147	S148	LID#
+VDD_IN	P148	S149	SLEEP#
+VDD_IN	P149	S150	VIN_PWR_BAD#
+VDD_IN	P150	S151	CHARGING#
+VDD_IN	P151	S152	CHARGER_PRSENT#
+VDD_IN	P152	S153	CARRIER_STBY#
+VDD_IN	P153	S154	CARRIER_PON
+VDD_IN	P154	S155	FORCE_RECOV#
+VDD_IN	P155	S156	BATLOW#
+VDD_IN	P156	S157	TEST#
		S158	VDD_IO_SEL#

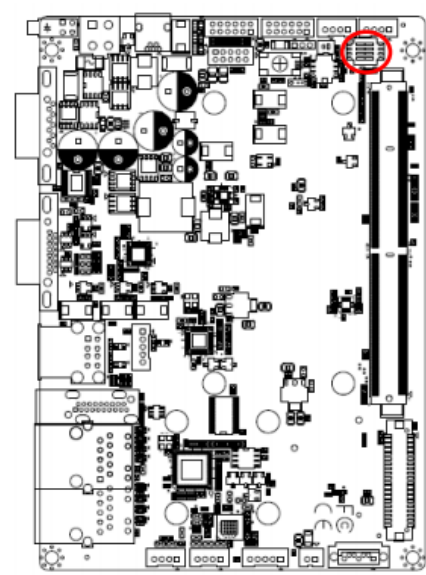
3. Linux User Guide

(Using with carrier board REV-SA01)

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3.1 Flash Yocto 4.1.15 image

1. Set the jumper to OTG mode.



Booting from onboard eMMC



Boot from SD card

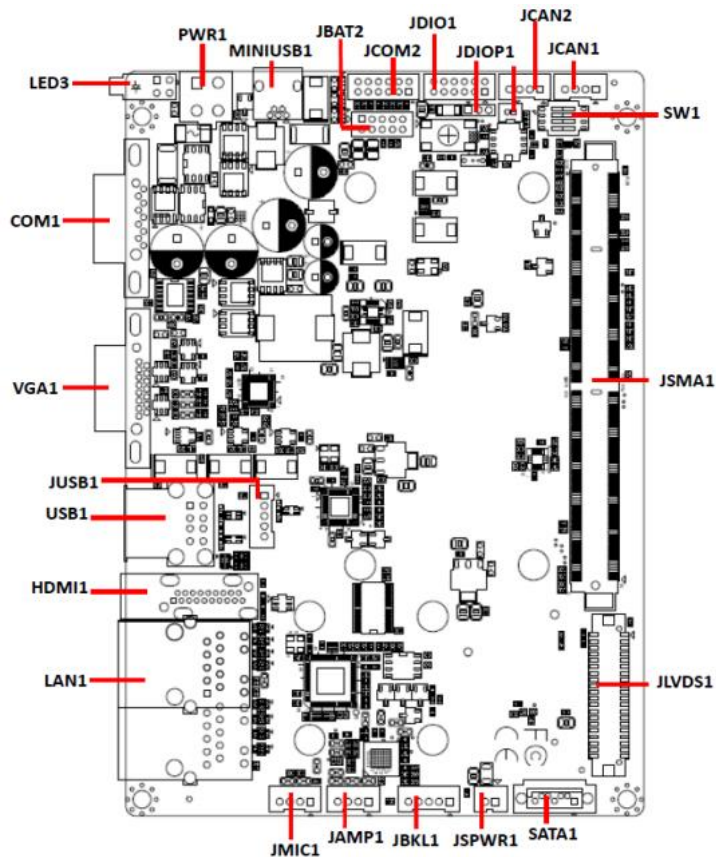


MFG tool mode mode(burning image file to onboard eMMC)

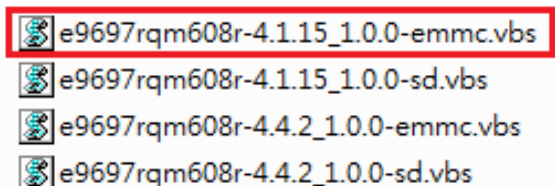


Signal	PIN	PIN	Signal
GND	1	8	BOOT_SELO#
GND	2	7	BOOT_SEL1#
GND	3	6	BOOT_SEL2#
GND	4	5	FORCE_RECOV#

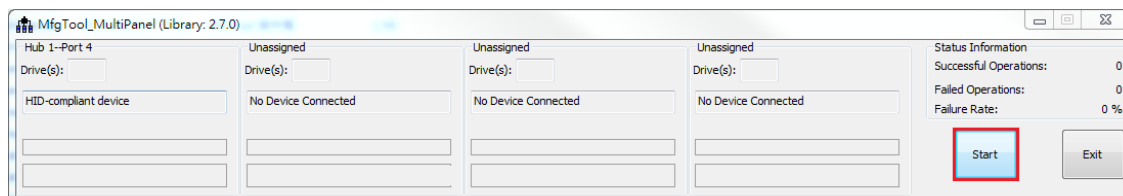
2. Connect REV-SA01 to computer through MINIUSB1 by mini USB.



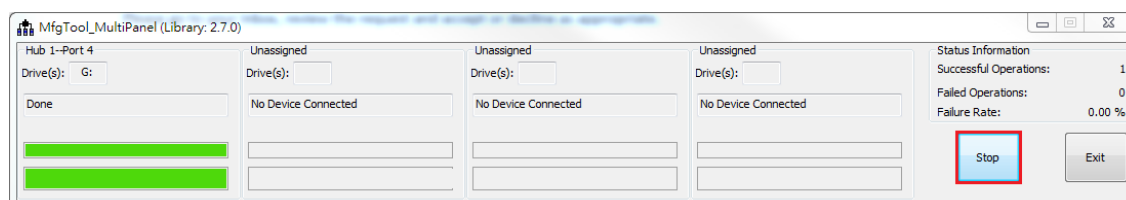
3. Please enter to MFG-Tools\vbs and execute xxxxxxxxxx-4.1.15_1.0.0-emmc.vbs.



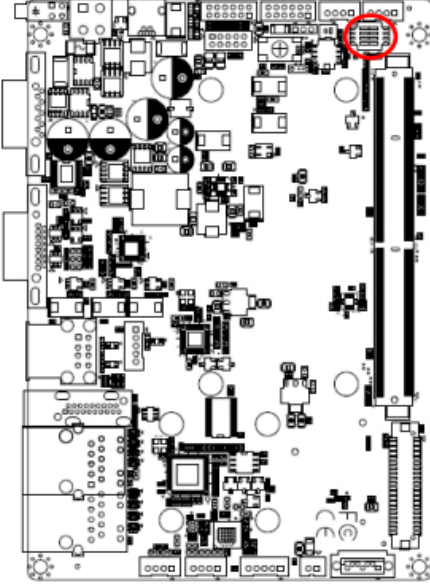
4. After execute xxx-emmc.vbs, please press “Start” to start flash OS.



5. After flash finish, please press “Stop”.



6. Set the jumper to “eMMC boot” and power on to boot to Yocto 4.1.15.



Booting from onboard eMMC



Boot from SD card



MFG tool mode mode(burning image file to onboard eMMC)



Signal	PIN	PIN	Signal
GND	1	8	BOOT_SEL0#
GND	2	7	BOOT_SEL1#
GND	3	6	BOOT_SEL2#
GND	4	5	FORCE_RECOV#

