RM-N8MP(L) SMARC 2.1

Computer-On-Module
with NXP ARM® Cortex® A53
i.MX8M Plus Quad / QuadLite SoC

User's Manual

Version 1.0
(June 2025)

iBASE

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Disclaimer

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Trademarks

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Compliance

CE The product described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

FC This product has been tested and found to comply with the limits for a Class B device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer’s instructions, may cause harmful interference to radio communications.

WEEE

This product must not be disposed of as normal household waste, in accordance with the EU directive of for waste electrical and electronic equipment (WEEE - 2012/19/EU). Instead, it should be disposed of by returning it to a municipal recycling collection point. Check local regulations for disposal of electronic products.

Green IBASE

This product complies with RoHS 2 restrictions, which prohibit the use of certain hazardous substances in electrical and electronic equipment. The following substances must not exceed the specified concentrations:

- Hexavalent chromium: 1,000 ppm
- Poly-brominated biphenyls (PBBs): 1,000 ppm
- Poly-brominated diphenyl ethers (PBDEs): 1,000 ppm
- Cadmium: 100 ppm
- Mercury: 1,000 ppm
- Lead: 1,000 ppm
- Bis(2-ethylhexyl) phthalate (DEHP): 1,000 ppm
- Butyl benzyl phthalate (BBP): 1,000 ppm
- Dibutyl phthalate (DBP): 1,000 ppm
- Diisobutyl phthalate (DIBP): 1,000 ppm

Important Safety Information

Carefully read the following safety information before using this device.

Setting up your system:

- Put the device horizontally on a stable and solid surface.
- Do not use this product near water.
- Do not use this product near any heated source.
- Leave plenty of space around the device and do not block the ventilation openings. Never drop or insert any objects of any kind into the openings.

Care during use:

- Do not place heavy objects on the top of the device.
- Make sure to connect the correct voltage to the device. Failure to supply the correct voltage could damage the unit.
- Do not place or allow objects to rest on the power cord, and do not walk on it.
- Ensure that the total ampere rating of all devices plugged into the extension cord does not exceed the cord's ampere rating.
- Do not spill water or any other liquids on your device.
- Always unplug the device and use only neutral cleaning agents when cleaning.
- Use a computer vacuum cleaner to remove dust and particles from the vents.

Product Disassembly

Do not try to repair, disassemble, or make modifications to the device. Doing so will void the warranty and may result in damage to the product or personal injury.

CAUTION

Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries by observing local regulations.

Warranty Policy

- **IBASE standard products:**

  24-month (2-year) warranty from the date of shipment. If the date of shipment cannot be ascertained, the product serial numbers can be used to determine the approximate shipping date.

- **3rd-party parts:**

  12-month (1-year) warranty from delivery for 3rd-party parts that are not manufactured by IBASE, such as CPU, CPU cooler, memory, storage devices, power adaptor, display panel and touch screen.

* However, products that fail due to misuse, accident, improper installation or unauthorized repair shall be treated as out of warranty and customers shall be billed for repair and shipping charges.

Technical Support & Services

1. Visit the IBASE website at www.ibase.com.tw to find the latest information about the product.
2. If you encounter any technical problems and require assistance from your distributor or sales representative, please prepare and send the following information:

   - Product model name
   - Product serial number
   - Detailed description of the problem
   - Error messages in text or screenshots if any
   - The arrangement of the peripherals
   - Software used (such as OS and application software)

3. If repair service is required, please apply for an RMA number from the IBASE's website or contact your distributor or sales representative for assistance.

Table of Contents

Chapter 1
General Information

The information provided in this chapter includes:

- Features
- Specifications
- Product View
- Dimensions

1.1 Introduction

SMARC ('Smart Mobility ARChitecture') is a specification published by the Standardization Group for Embedded Technologies e.V. (SGET) for **Computer-on-Modules (COMs)**. SMARC Computer-on-Modules are specifically designed for the development of compact, low-power systems. Generally, SMARC modules are based on ARM processors and other low-power SoC architectures.
Measuring 82 mm × 50 mm, the RM-N8MP(L) SMARC module integrates the i.MX 8M Plus or i.MX 8M Plus Lite processor.

1.2 Features

- NXP Cortex™-A53 i.MX 8M Plus Quad / QuadLite Core 1.6 GHz Industrial Grade SoC
- Supports 64-bit Arm® v8-A architecture
- Cortex®-M7 CPU operating up to 800 MHz
- 3 GB LPDDR4, 16 GB eMMC onboard
- Rich peripheral I/O support
- Validated with Yocto 4.2 (kernel 6.1.55) / Android 11
- Long-term supply with NXP solution
- Fully compliant with SMARC™ 2.1 specification

1.3 Specifications

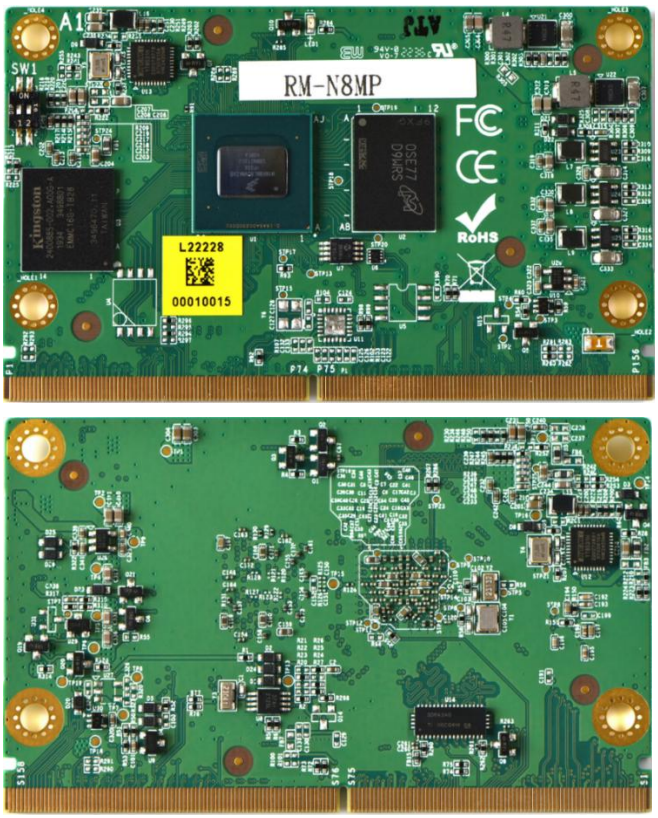
Product Name	RM-N8MP(L)
Form Factor	SMARC™2.1 82 x 50 mm
System	
Operating System	• Android11 • Yocto 4.2 (kernel 6.1.55) • Other OS (by request)
CPU Type	NXP Cortex™ A53 i.MX8M Plus Quad / QuadLite Core 1.6 GHz Industrial Grade SOC Supports 64-bit Arm® v8-A architecture
MCU Type	Cortex®-M7 CPU operating up to 800 MHz
Neural Processing Unit (NPU) (8M Plus Only)	2.3 TOP/s Neural Network performance • Keyword detect, noise reduction, beamforming • Speech recognition (i.e. Deep Speech 2) • Image recognition (i.e. ResNet-50)
Memory	System memory: 3 GB LPDDR4 (optional 2 or 4 GB available) Data Memory: 16 GB eMMC (optional up to 64GB available)

On-chip Memory	Boot ROM (256 KB) On-chip RAM (768 KB)
Video Processing Unit (8M Plus Only)	Video Decode: • 1080p60 HEVC/H.265 Main, Main 10 (up to level 5.1) (VPU G2) • 1080p60 VP9 Profile 0, 2 (VPU G2) • 1080p60 VP8 (VPU G1) • 1080p60 AVC/H.264 Baseline, Main, High decoder (VPU G1) Video Encode: • 1080p60 AVC/H.264 encoder • 1080p60 HEVC/H.265 encoder
Graphics Processing Unit	GC7000UL with OpenCL and Vulkan support • 2 shader • 166 million triangles/sec • 1.0 giga pixel/sec • 16 GFLOPs 32-bit • Supports OpenGL ES 1.1, 2.0, 3.0, OpenCL 1.2, Vulkan • Core clock frequency of 1000 MHz • Shader clock frequency of 1000 MHz • GC520L for 2D acceleration • Render target compatibility between 3D and 2D GPU (super tile status buffer
RTC	1337AGDVGI8
Watchdog Timer	Yes (256 segments, 0, 1, 2…128 secs)
Dimensions	82 x 50 mm (3.22” x 1.97”)
Certification	CE, FCC Class B
I/O Ports	
HDMI 2.0a Tx	1x HDMI2.0a • Resolutions of: 720 x 480p60, 1280 x 720p60, 1920 x 1080p60, 1920 x 1080p120, 3840 x 2160p30; Pixel clock up to 297 MHz • Audio support: 32-channel audio output support; 1 SPDIF audio eARC input support
MIPI DSI	1x MIPI DSI (Supports up to 1920x1200p60)
LVDS	2x LVDS (Supports up to 1920x1200p60)

MIPI CSI	2x MIPI CSI (2x ISP supporting 375 Mpixel/s aggregate performance and up to 3-exposure HDR processing. • When one camera is used, support up to 12MP@30fps or 4kp45 • When two cameras are used, each supports up to 1080p80)
PCIe	1x PCIe (supporting PCIe Gen3)
CSPI	1x CSPI
QSPI	1x QSPI
SDIO	1x SDIO
CAN	2x CAN
I2C	4x I2C
UART	4x UART
AUDIO	2x I2S
LAN	2x GbE LAN (Dual GbE LAN with simultaneous operation support)
USB	2x USB 3.0 with OTG interface
GPIO	12x GPIO
Environment	
Operating Temperature	-40°C~ 85°C with heat sink or through housing design -40°C~ 65°C without heatsink
Relative Humidity	10 ~ 90 %, non-condensing

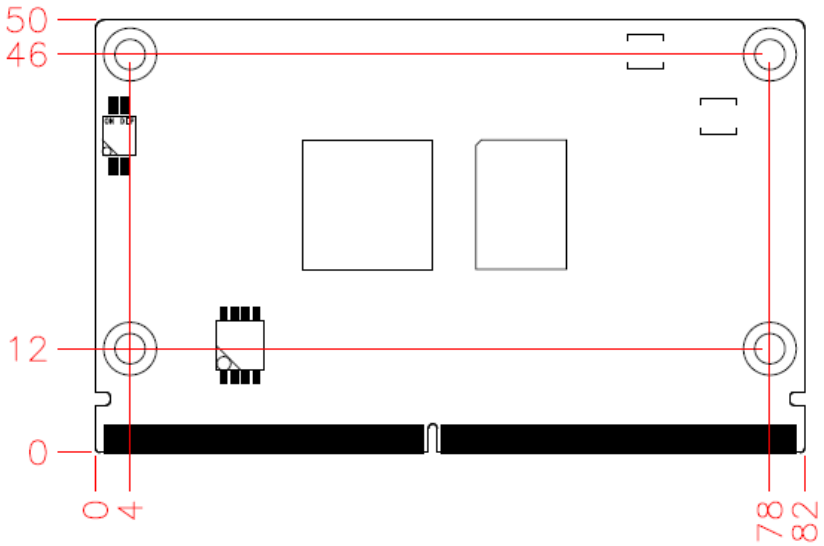
All specifications are subject to change without prior notice.

1.4 Product View



1.5 Dimensions

Unit: mm



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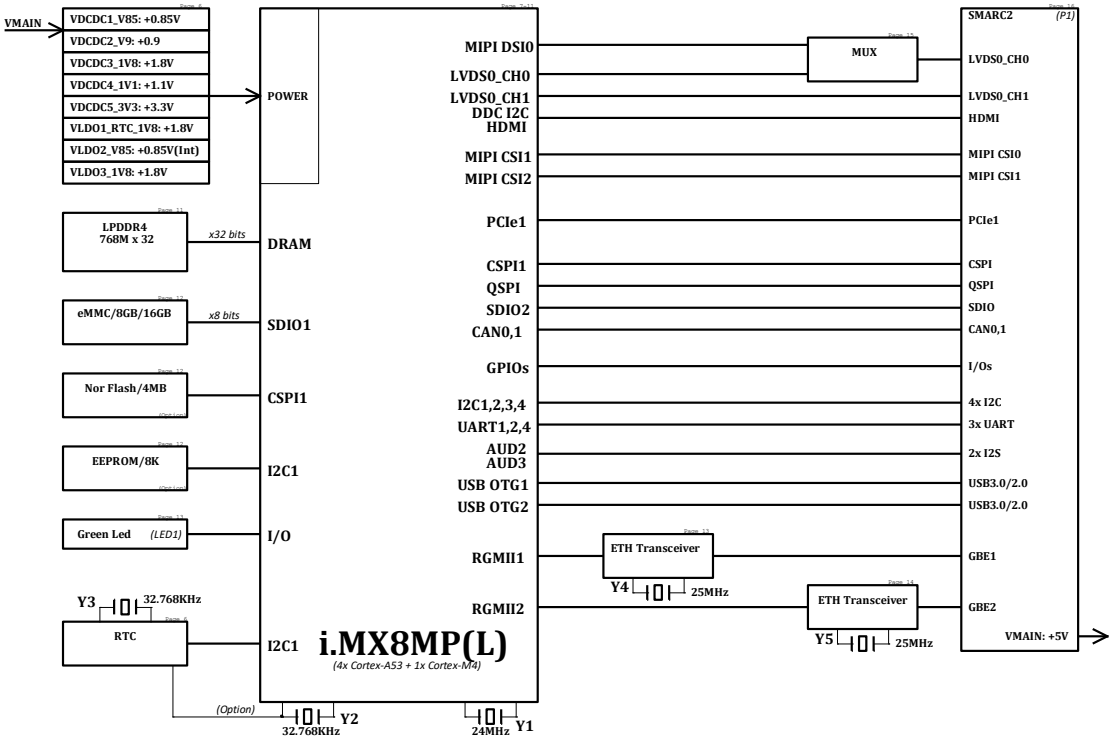
Chapter 2
Hardware Configuration

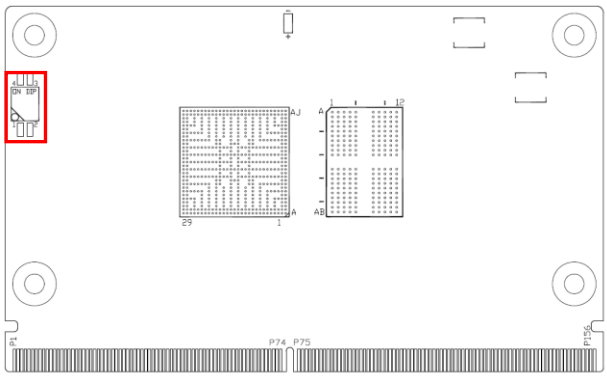
This section contains general information about:

- System Block diagram
- Switch on RM-N8MP(L)
- Module Outline
- Carrier Board Connector PCB Footprint
- Module Pin Assignments

2.1 System Block diagram

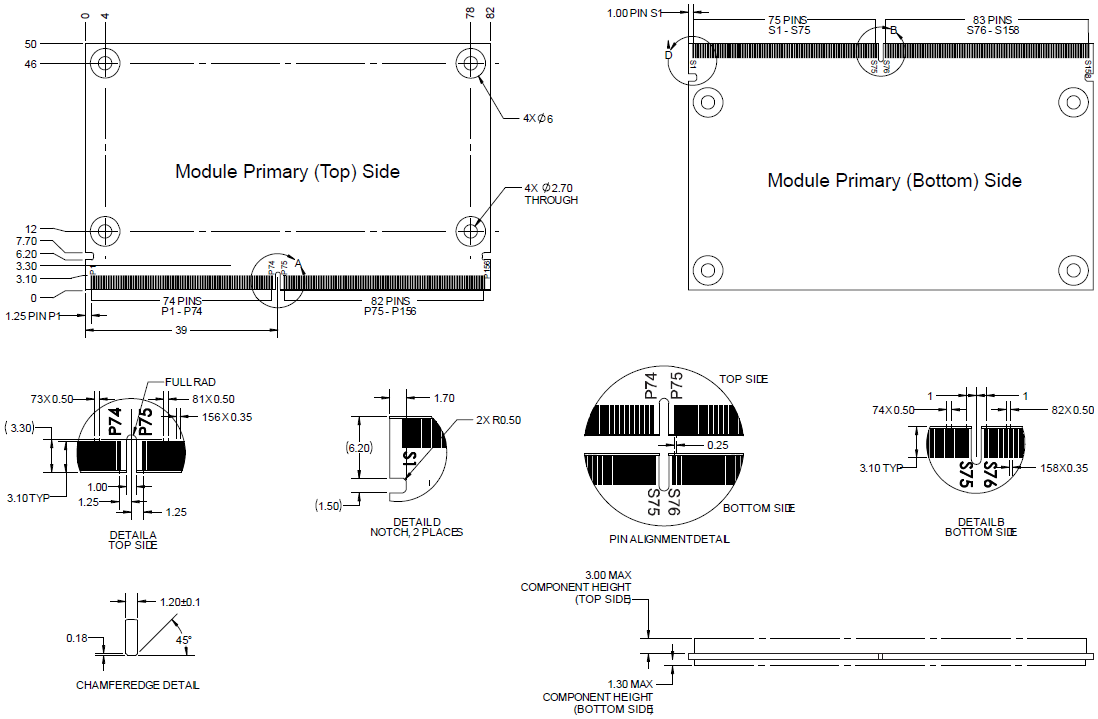


2.2 Switch on RM-N8MP(L)

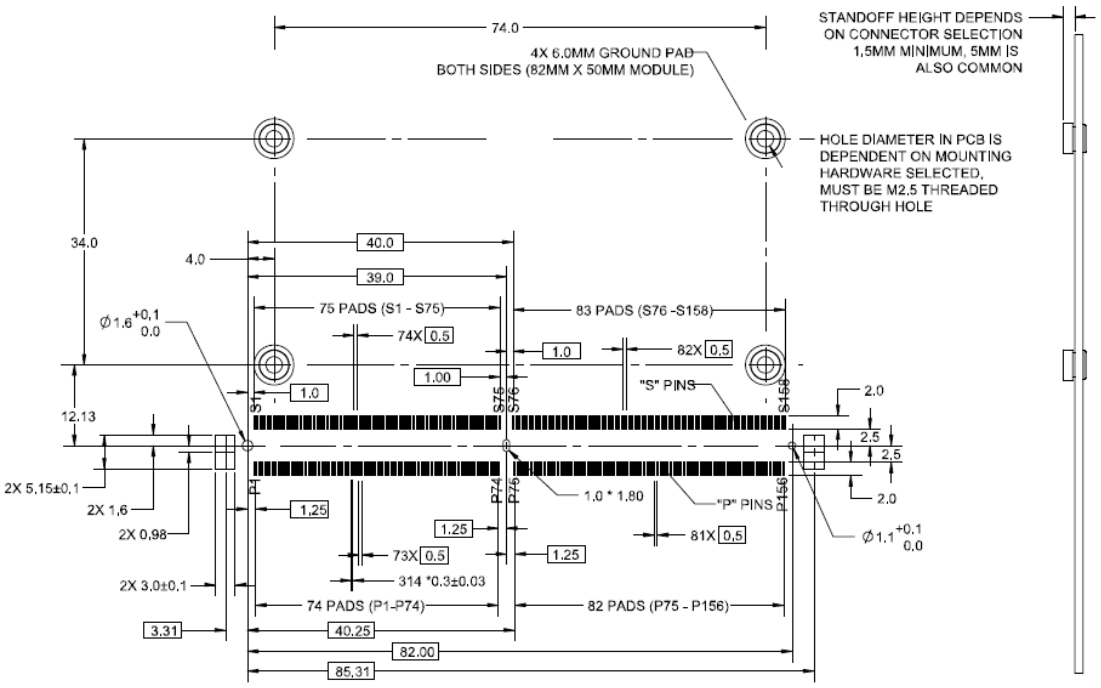


Mode	Signal Name	
	SW1_1-4	SW1_2-3
Normal Boot	OFF	OFF
Auto Test	OFF	ON
USB Download	ON	x

2.3 Module Outline



2.4 Carrier Board Connector PCB Footprint



2.5 Module Pin Assignments

Pin	Assignment	Pin	Assignment
P1	SMB_ALT_B/ GPIO2_06/BT_RESET	S1	I2C2_SCL
P2	GND	S2	I2C2_SDA
P3	CSI_P2_CKP	S3	GND
P4	CSI_P2_CKN	S4	NC
P5	NC	S5	I2C1_SCL
P6	NC	S6	CLKO1_CSI_MCLK
P7	CSI_P2_DP0	S7	I2C1_SDA
P8	CSI_P2_DN0	S8	CSI_P1_CKP
P9	GND	S9	CSI_P1_CKN
P10	CSI_P2_DP1	S10	GND
P11	CSI_P2_DN1	S11	CSI_P1_DP0
P12	GND	S12	CSI_P1_DN0
P13	CSI_P2_DP2	S13	GND
P14	CSI_P2_DN2	S14	CSI_P1_DP1
P15	GND	S15	CSI_P1_DN1
P16	CSI_P2_DP3	S16	GND
P17	CSI_P2_DN3	S17	GBE1_TRXP0
P18	GND	S18	GBE1_TRXN0
P19	GBE0_TRXN3	S19	GBE1_LED_10_100
P20	GBE0_TRXP3	S20	GBE1_TRXP1
P21	GBE0_LED_10_100	S21	GBE1_TRXN1
P22	GBE0_LED_1000	S22	GBE1_LED_1000
P23	GBE0_TRXN2	S23	GBE1_TRXP2
P24	GBE0_TRXP2	S24	GBE1_TRXN2
P25	GBE0_LED_ACT	S25	GND
P26	GBE0_TRXN1	S26	GBE1_TRXP3
P27	GBE0_TRXP1	S27	GBE1_TRXN3
P28	ETH0_VDDIO	S28	ETH1_VDDIO
P29	GBE0_TRXN0	S29	NC
P30	GBE0_TRXP0	S30	NC
P31	NC	S31	GBE1_LED_ACT
P32	GND	S32	NC
P33	SD2_WP	S33	NC
P34	SD2_CMD	S34	GND

Pin	Assignment	Pin	Assignment
P35	SD2_CD_B	S35	NC
P36	SD2_CLK	S36	NC
P37	SD2_RESET_B	S37	USB_OTG2_VBUS_DET
P38	GND	S38	AP_CODEC_MCLK
P39	SD2_DATA0	S39	AP_AUD3_TXFS
P40	SD2_DATA1	S40	AP_AUD3_TXD
P41	SD2_DATA2	S41	AP_AUD3_RXD
P42	SD2_DATA3	S42	AP_AUD3_TXC
P43	CSPI1_SS0	S43	GPIO3_14/QSPIA_DQS
P44	CSPI1_SCLK	S44	NC
P45	CSPI1_MISO	S45	NC
P46	CSPI1_MOSI	S46	NC
P47	GND	S47	GND
P48	NC	S48	I2C3_SCL
P49	NC	S49	I2C3_SDA
P50	GND	S50	HDA_AUD2_TXFS
P51	NC	S51	HDA_AUD2_TXD
P52	NC	S52	HDA_AUD2_RXD
P53	GND	S53	HDA_AUD2_TXC
P54	GPIO3_01/QSPIA_CS0	S54	SATA_ACT_B/ GPIO2_00/SD1_CLK
P55	NC	S55	NC
P56	GPIO3_00/QSPIA_SCLK	S56	GPIO3_08/QSPIA_IO2
P57	GPIO3_07/QSPIA_IO1	S57	GPIO3_09/QSPIA_IO3
P58	GPIO3_06/QSPIA_IO0	S58	GPIO2_11/QSPIA_RST_B
P59	GND	S59	NC
P60	USB1_DP	S60	NC
P61	USB1_DN	S61	GND
P62	GPIO1_13/USBOTG1_OC_B	S62	USB2_TXP
P63	USB_OTG1_VBUS_DET	S63	USB2_TXN
P64	USB1_ID	S64	GND
P65	NC	S65	USB2_RXP
P66	NC	S66	USB2_RXN
P67	NC	S67	GND
P68	GND	S68	USB2_DP
P69	NC	S69	USB2_DN
P70	NC	S70	GND

Pin	Assignment	Pin	Assignment
P71	GPIO1_12/USBOTG1_PWR	S71	USB1_TXP
P72	NC	S72	USB1_TXN
P73	NC	S73	GND
P74	NC	S74	USB1_RXP
P75	GPIO1_03/M2_RST_B	S75	USB1_RXN
P76	NC	S76	NC
P77	NC	S77	NC
P78	PMIC_STBY_REQ	S78	NC
P79	GND	S79	NC
P80	NC	S80	GND
P81	NC	S81	NC
P82	GND	S82	NC
P83	PCIe1_REFCKP	S83	GND
P84	PCIe1_REFCKN	S84	NC
P85	GND	S85	NC
P86	PCIe1_RX_P	S86	GND
P87	PCIe1_RX_N	S87	NC
P88	GND	S88	NC
P89	PCIe1_TX_P	S89	GND
P90	PCIe1_TX_N	S90	NC
P91	GND	S91	NC
P92	HDMI_TX2_P	S92	GND
P93	HDMI_TX2_N	S93	NC
P94	GND	S94	NC
P95	HDMI_TX1_P	S95	NC
P96	HDMI_TX1_N	S96	NC
P97	GND	S97	NC
P98	HDMI_TX0_P	S98	NC
P99	HDMI_TX0_N	S99	NC
P100	GND	S100	NC
P101	HDMI_TXC_P	S101	GND
P102	HDMI_TXC_N	S102	NC
P103	GND	S103	NC
P104	HDMI_HPD	S104	USB2_ID
P105	CK/AUX+	S105	NC
P106	DAT/AUX-	S106	NC
P107	CEC/AUX	S107	GPIO4_19/LVDS_BL_PWEN

Pin	Assignment	Pin	Assignment
P108	GPIO3_21/CSI1_PWEN_B	S108	LVDS1_CLK_P
P109	GPIO3_20/CSI2_PWEN_B	S109	LVDS1_CLK_N
P110	GPIO3_19/CSI1_RST_B	S110	GND
P111	GPIO1_15/CSI2_RST_B	S111	LVDS1_TX0_P
P112	HDA_RST_B/ GPIO2_07/BT_H_WAKE_B	S112	LVDS1_TX0_N
P113	GPIO5_03/PWM3_OUT	S113	NC
P114	TACHIN/ GPIO5_05/WIFI_REGON	S114	LVDS1_TX1_P
P115	GPIO4_29/CODEC_INT_B	S115	LVDS1_TX1_N
P116	5V_EN/ GPIO2_09/WIFI_WAKE_B	S116	GPIO4_22/LVDS_EN
P117	GPIO4_18/TP_INT_B	S117	LVDS1_TX2_P
P118	GPIO4_27/TP_RST_B	S118	LVDS1_TX2_N
P119	GPIO4_21/TP_EN_B	S119	GND
P120	GND	S120	LVDS1_TX3_P
P121	I2C4_SCL	S121	LVDS1_TX3_N
P122	I2C4_SDA	S122	LVDS_BL_PWM/ GPIO5_04/PWMO2
P123	BOOT_MODE0	S123	NC
P124	BOOT_MODE1	S124	NC
P125	BOOT_MODE3	S125	DSI/LVDS0_TX0_P
P126	RESET_OUT_B	S126	DSI/LVDS0_TX0_N
P127	RESET_IN_B	S127	GPIO4_28/LCD_BL_PWEN
P128	ONOFF_B	S128	DSI/LVDS0_TX1_P
P129	UART1_TXD	S129	DSI/LVDS0_TX1_N
P130	UART1_RXD	S130	GND
P131	UART_TX3	S131	DSI/LVDS0_TX2_P
P132	UART_RX3	S132	DSI/LVDS0_TX2_N
P133	GND	S133	GPIO4_01/LCD_EN
P134	UART_TX0	S134	DSI/LVDS0_CLK_P
P135	UART_RX0	S135	DSI/LVDS0_CLK_N
P136	UART4_TXD/CSPI2_MOSI	S136	GND
P137	UART4_RXD/CSPI2_SCLK	S137	DSI/LVDS0_TX3_P
P138	UART4_RTS/CSPI2_SS0	S138	DSI/LVDS0_TX3_N
P139	UART4_CTS/CSPI2_MISO	S139	I2C1_SCL
P140	UART2_TXD	S140	I2C1_SDA

Pin	Assignment	Pin	Assignment
P141	UART2_RXD	S141	LCD_BL_PWM/ GPIO1_01/PWMO1
P142	GND	S142	NC
P143	CAN1_TX	S143	GND
P144	CAN1_RX	S144	NC
P145	CAN2_TX	S145	WDOG1_OUTPUT_B
P146	CAN2_RX	S146	PCIe_WAKE_B/ GPIO2_04/SD1_DATA2
P147	+5V	S147	LI_CELL
P148	+5V	S148	LID_B/ GPIO2_01/SD1_CMD
P149	+5V	S149	SLEEP_B/ GPIO2_05/ SD1_DATA3
P150	+5V	S150	VIN_PWR_BAD_B
P151	+5V	S151	CHARGING_B/ GPIO2_02/SD1_DATA0
P152	+5V	S152	CHR_PRSNT_B/ GPIO2_08/BT_WAKE_B
P153	+5V	S153	SYSTEM_STBY_B
P154	+5V	S154	PWR_ON
P155	+5V	S155	F_RECOV_B/ GPIO2_03/SD1_DATA1
P156	+5V	S156	BATLOW_B/ GPIO1_00/WIFI_CK
		S157	GPIO4_20/ AT_DET_B
		S158	GND

Chapter 3
Software Setup

This chapter introduces the following procedures for firmware installation (for advanced users only):

- Burn Firmware via USB
- Burn Firmware by microSD method

3.1 Burn Firmware via USB

3.1.1 Boot into Download Mode

1) Connect the PC to the device's mini-USB port using a USB OTG cable.

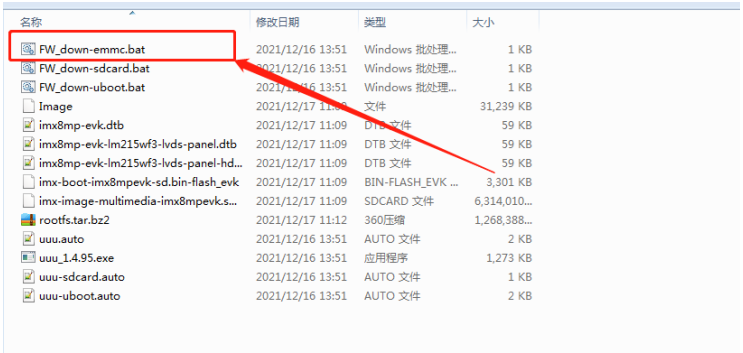
2) Set RM-N8MP(L) SW1 as "1= ON, 2=OFF".

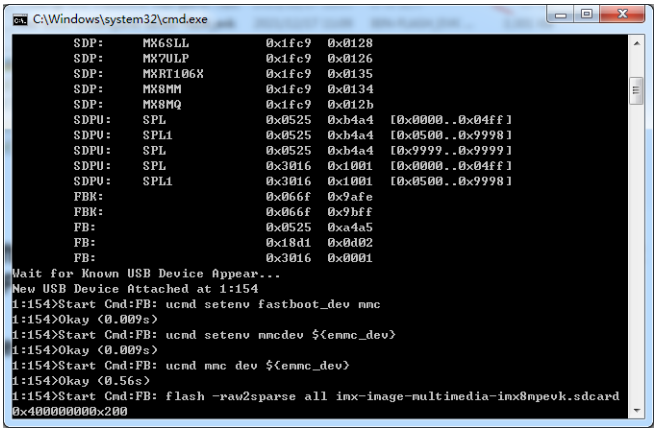
3) Set RP-103-SMC SW1 as "1= OFF, 2=OFF, 3=OFF, 4=OFF".

4) Power on the device.
5) The device will then boot into Download Mode.

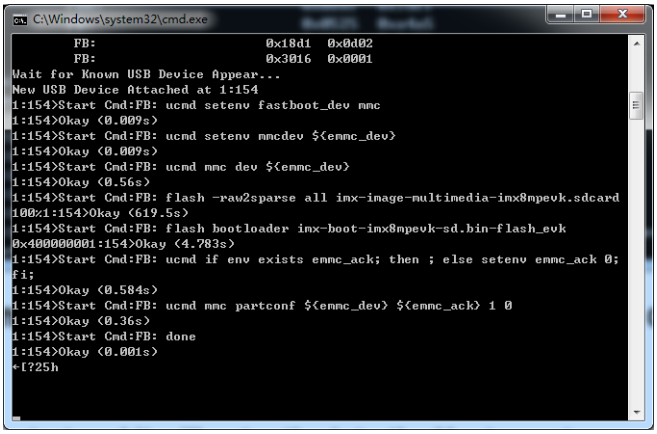
3.1.2 Yocto Firmware Burn

1) Double-click **FW_down-emmc.bat** to install the Yocto system.



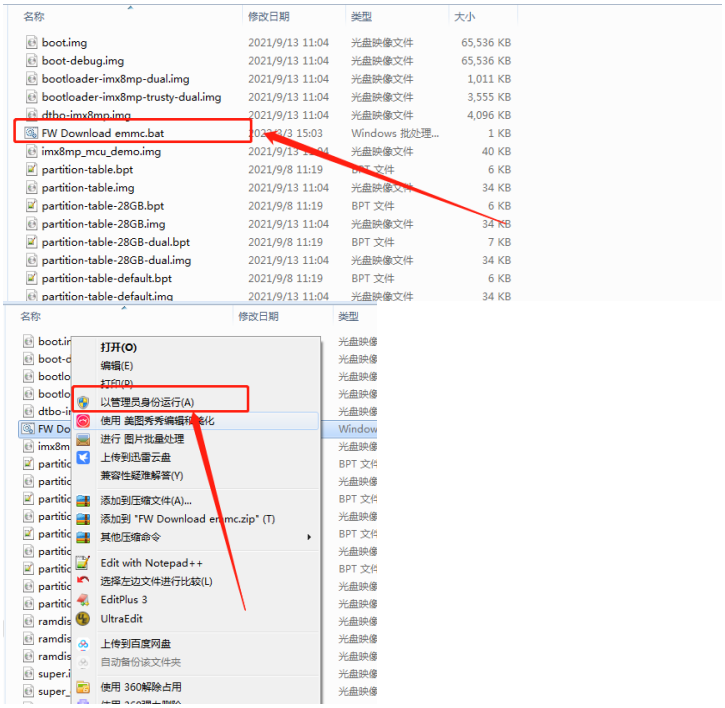


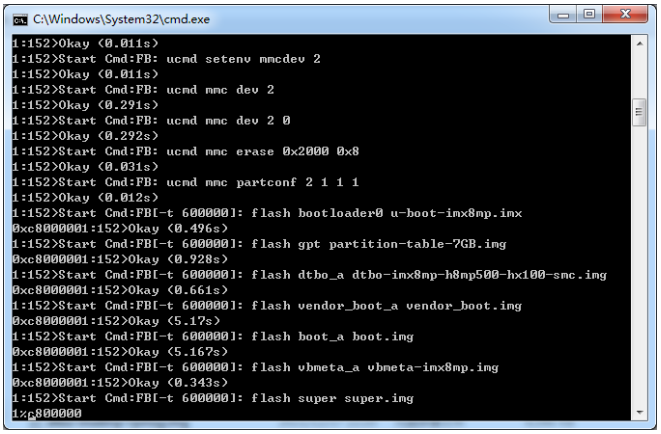
2) The Yocto firmware installation is complete.



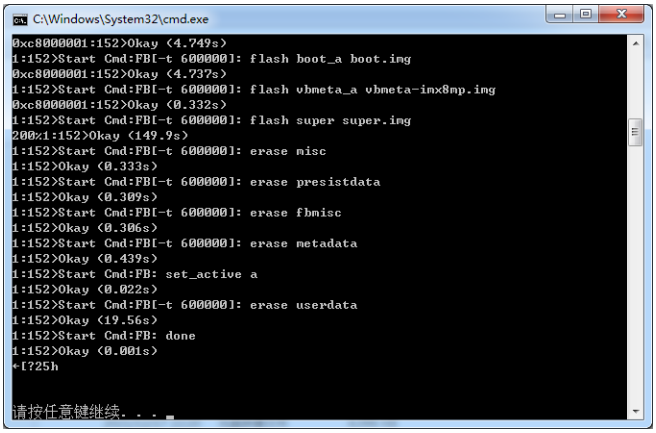
3.1.3 Android Firmware Burn

1) Run **FW Download emmc.bat** as Administrator to install the Android system.





2) The Android firmware installation is complete.



3) After burning, set the DIP switch SW1 (1=OFF, 2=OFF).

4) Restart the device and it will boot into the normal system.

3.2 Burn firmware by microSD method

Note: This is for advanced users with an IBASE standard image file.

Basically, IBASE carrier board RP-103-SMC is preloaded with an OS (Android or Yocto) into eMMC by default. Connect the HDMI with RP-103-SMC, and 12V/24V power directly.

This chapter guides you to make a recovery boot-up microSD card.
Preparing the Recovery SD Card to Install Linux / Android Image to eMMC

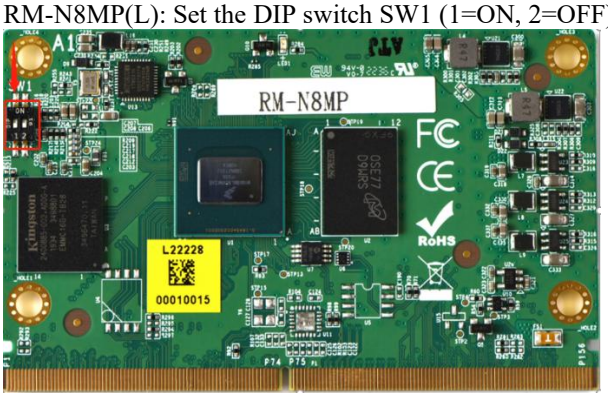
Note: All data in the eMMC will be erased.

System requirements:
Operating System: Windows 7 or later
Tool: uuu
SD card: 4 GB or greater in size

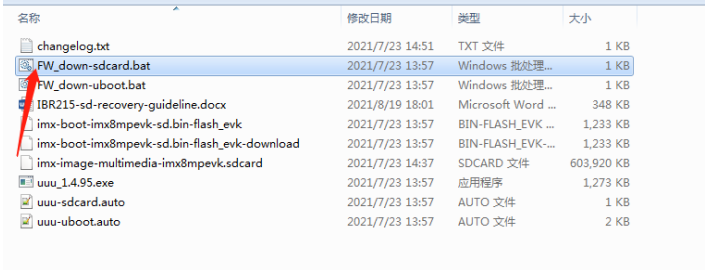
3.2.1 Prepare Recovery SD Card

1) Insert the SD card into the P3 connector. Connect the board to a PC via the mini-USB port (P17 connector), and set the DIP switch to enter Download Mode.

RM-N8MP(L): Set the DIP switch SW1 (1=ON, 2=OFF)



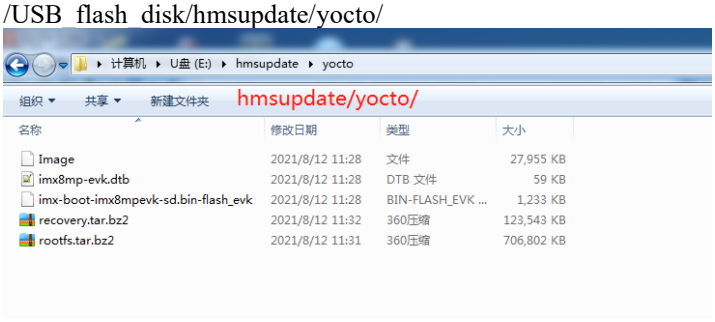
2) Boot and flash the SD card using the command "uuu.exe uuu-sdcard.auto" or double-click **FW_down-sdcard.bat** (same as the PCBA update method).



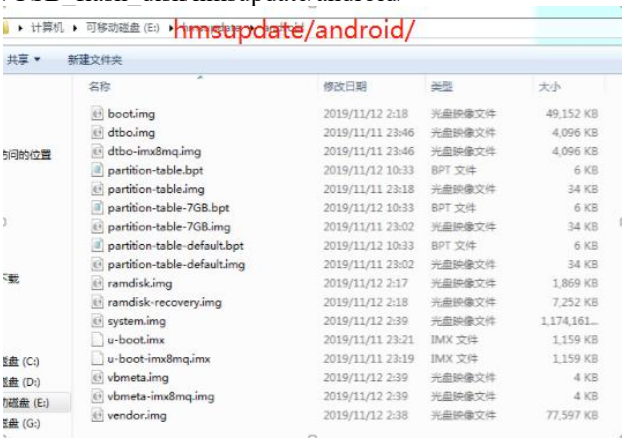
3.2.2 Upgrade Firmware through the Recovery SD Card

1) Put recovery files into USB flash disk (FAT32)

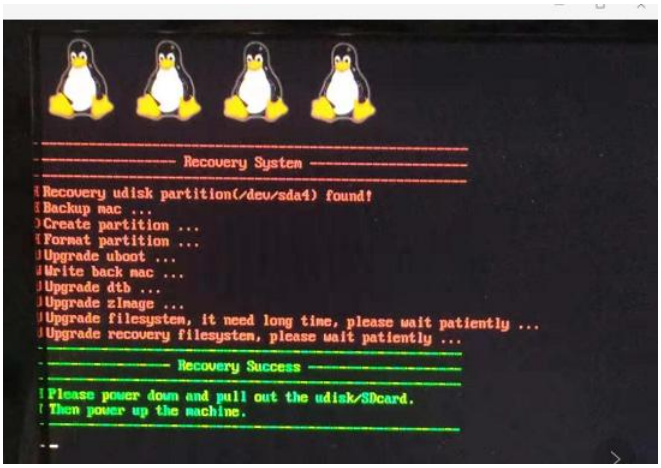
yocto/Ubuntu: Copy all recovery files into PATH:
/USB_flash_disk/hmsupdate/yocto/



Android: Copy all recovery files into PATH:
/USB_flash_disk/hmsupdate/android/



2) Plug the SD card and USB flash disk into the RP-103-SMC
3) Set SW1 to: 1 = ON, 2 = OFF, 3 = OFF, 4 = OFF, then boot the RP-103-SMC.
4) The update information will show on HDMI.
5) Once 'Flashing successfully completed' appears, power off the system.

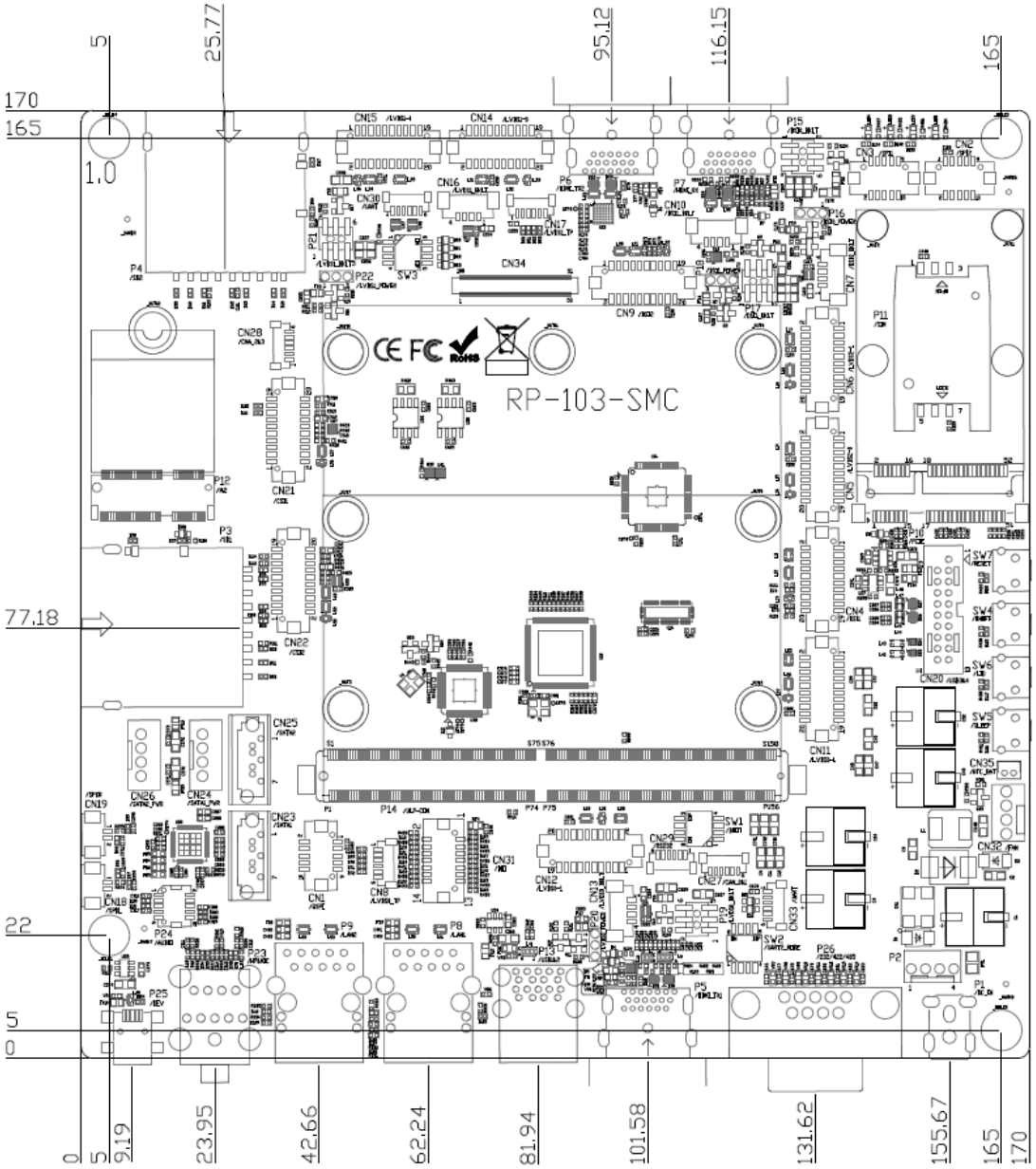


Appendix

This appendix contains the following information:

RP-103-SMC Dimensions
RP-103-SMC I/O View

A. RP-103-SMC Dimensions



B. RP-103-SMC I/O View