

RM-N8MMI
SMARC 2.0 CPU Module
with NXP ARM® Cortex®
A53 i.MX8M Mini Quad SoC

User's Manual

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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 cables and cabling techniques.

FCC

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.

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This product must not be disposed of as normal household waste, in accordance with the EU directive 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 Handling and Safety Information

Carefully read the following handling and integration safety information before installing or operating the RM-N8MMI module.

System Integration Notice

- The RM-N8MMI module is intended for integration into a custom or standard SMARC 2.0 carrier board.
- Do not power or operate the module independently. Always ensure the carrier board design complies with SMARC electrical, mechanical, and thermal specifications.

Handling Precautions

- Handle the module only in an ESD-protected environment.
- Avoid mechanical shock, bending, or flexing of the PCB.
- Store the module in an anti-static bag when not in use.
- Avoid touching connector fingers or exposed components.
- The RM-N8MMI is a sealed PCB assembly; do not disassemble, rework, or modify components unless authorized by the manufacturer.

Power Safety

- The supply voltage to the module must follow SMARC 2.0 specifications (typically 3.3 V and/or 5 V provided from the carrier).
- Always verify correct polarity and stable power rails before power-on.
- Do not insert or remove the module while the carrier board is powered.

Warranty Policy

IBASE warrants its RM-N8MMI SMARC module against defects in materials and workmanship for a period of 24 months from the date of shipment. If the shipment date is unavailable, the serial number will be used to determine the approximate manufacturing date.

Third-party components supplied with or integrated into the module (e.g., memory, storage devices, power adapters, or display panels) carry a 12-month warranty, or as defined by their respective manufacturers.

The warranty does not apply to products that have been:

- Damaged by accident, misuse, or improper installation
- Modified, repaired, or reworked without IBASE authorization
- Operated outside of rated electrical or environmental conditions

Out-of-warranty repairs may be performed at customer expense, including shipping and handling costs.

Technical Support & RMA Service

For product updates, technical assistance, or documentation, please visit the IBASE website: <https://www.ibase.com.tw>

If technical support is required, please contact your IBASE representative and provide the following information:

- Product model name and serial number
- Description of the issue and steps to reproduce it
- Firmware or operating system version
- Connected peripherals and configuration details
- Any error logs, console output, or screenshots (if available)

For repair or replacement service, please obtain a Return Material Authorization (RMA) number through the IBASE website before returning any product.

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Chapter 1

General Information

The information provided in this chapter includes:

- Features
- Specifications
- Product View
- Dimensions

1.1 Introduction

The RM-N8MMI SMARC 2.0 CPU Module is built with NXP ARM Cortex-A53 i.MX 8M Mini Quad 1.6GHz industrial-grade processors. Together with a customized carrier board equipped with an array of serial, video and network interfaces, the RM-N8MMI solution is the perfect choice for multimedia and IoT applications that require low power and high performance in transportation passenger information and entertainment systems.

The modular approach of the SMARC specification allows customers to take full advantage of the scalability benefit, optimized time-to-market and upgrade capability," said Archer Chien, Director of Solution Product Planning Dept. at IBASE. "The cost-efficient RM-N8MMI offers a competitive advantage to our customers by reducing the Total Cost of Ownership (TCO) and lowering the lifecycle costs."

The RM-N8MMI module measures 82mm by 50mm and features Vivante's GC 320 GPU, 2GB soldered LPDDR4 and 8GB eMMC on board (other capacities optional). Extensive I/Os supported include 1x GbE, 2x USB 2.0 with OTG interface, 1x MIPI CSI-2 for image capture, 4x UART, 2x SPI, 2x I2S, and 1x PCI-E (x1) Gen2.

Shipped with extended longevity of up to 10 years, the RM-N8MMI is provided with Yocto BSP and Android 9.0 (legacy support) support. It is available with an industrial grade variant that runs from -40°C to +85°C extended temperature, as well as the RP-113 carrier board providing users a rich set of interfaces and 12V~24V DC input.

1.2 Features

- With NXP Cortex™-A53 i.MX 8M Mini Quad 1.6GHz industrial-grade processors
- 2GB LPDDR4, 8GB eMMC on board
- Wide operating temperature from -40°C to 85°C
- Rich peripheral I/O support
- Validated with Yocto v2.5 and Android 9.0 (legacy support)
- Long life time supply with NXP solution
- Compliant with SGeT standard SMARC™ V2.0

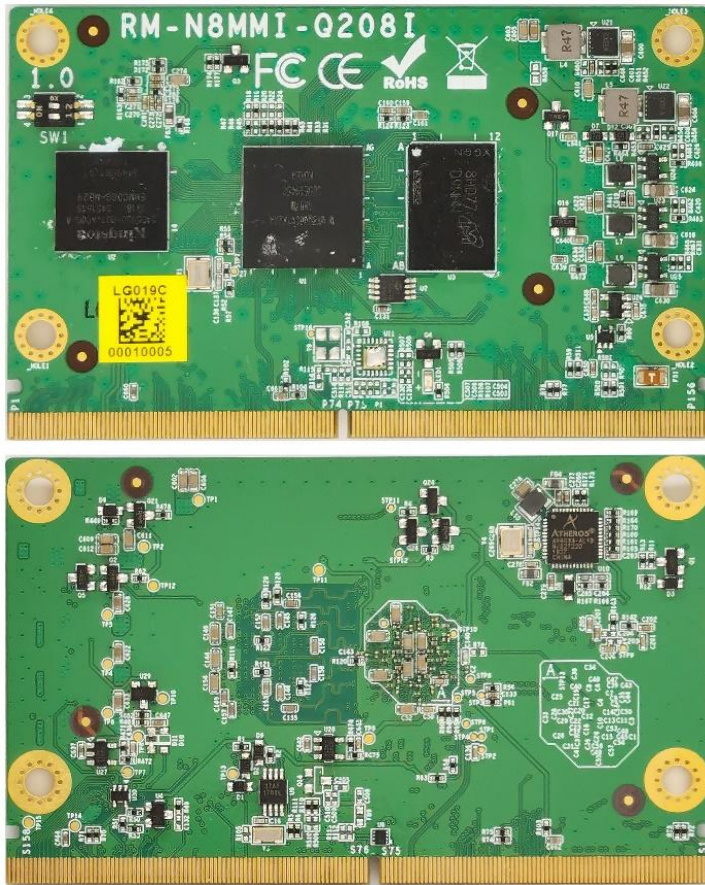
1.3 Specifications

Product Name	RM-N8MMI
Form Factor	SMARC™ 2.0 - 82 mm × 50 mm
Processor	NXP i.MX 8M Mini Quad Cortex-A53 and Cortex-M4
System Memory	2GB LPDDR4, 8GB eMMC
Video Codec	<ul style="list-style-type: none"> • 1080p60 VP9 • 1080p60 HEVC/H.265 decoder • 1080p60 AVC/H.264 Baseline, Main, High decoder • 1080p60 VP8 • 1080p60 AVC/H.264 encoder • 1080p60 VP8 • TrustZone support
Graphics	Vivante GC320
I/O Ports	
Audio Interface	2x I2S, 1x SPDIF
USB	2x USB2.0 with OTG interface
Display	1x MIPI-DSI 4-lane
Image Capture Interface	1x MIPI-CSI2 4-lane
Serial Interface	4x UART 2x SPI Interface
Media Interface	2x High-speed MMC/SDIO (MMC 8-bit, SDIO 4-bit)
PCI-E	1x PCI-E x1-lane Gen2
GPIO	12x GPIO
I²C	4x I ² C
Others	<ul style="list-style-type: none"> • RTC: Yes • Watchdog timer: 1~6553s, power on/off 4s • 1x Green LED for power status • Wireless WCN3980 (option)
CAN Bus	N/A
OS Support	Yocto 2.5 / Android 9 (legacy support)
Certification	CE / FCC Class B
Dimensions	
PCB Dimensions	82mm x 50mm (3.23" x 1.97") Max component height - Top Side: 3.0mm - Bottom Side: 1.3mm Thickness: 1.2mm - Golden Finger: 45° chamfer (0.18mm)
Environment	

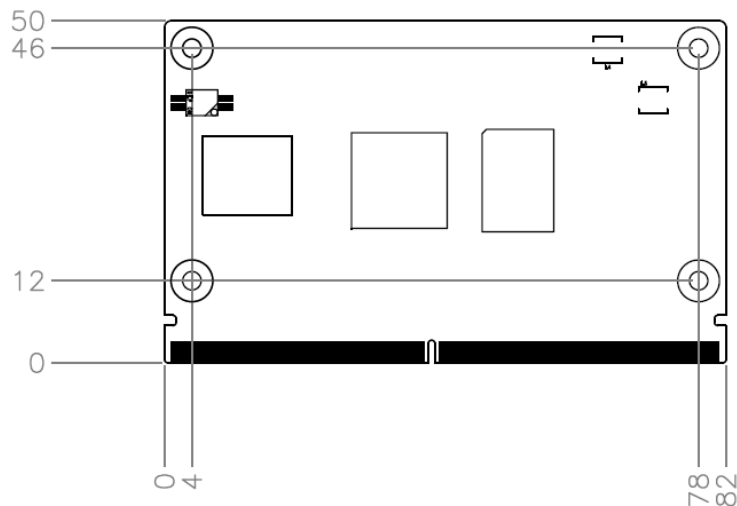
Temperature	Operating: -40°C to +85°C (Industrial grade, with heat-sink) Storage: -40°C to 85°C(-40°F~185°F)
Relative Humidity	0 % to 90 % RH at 60° C (non-condensing)

All specifications are subject to change without prior notice.

1.4 Product View



1.5 Dimensions



Unit: mm

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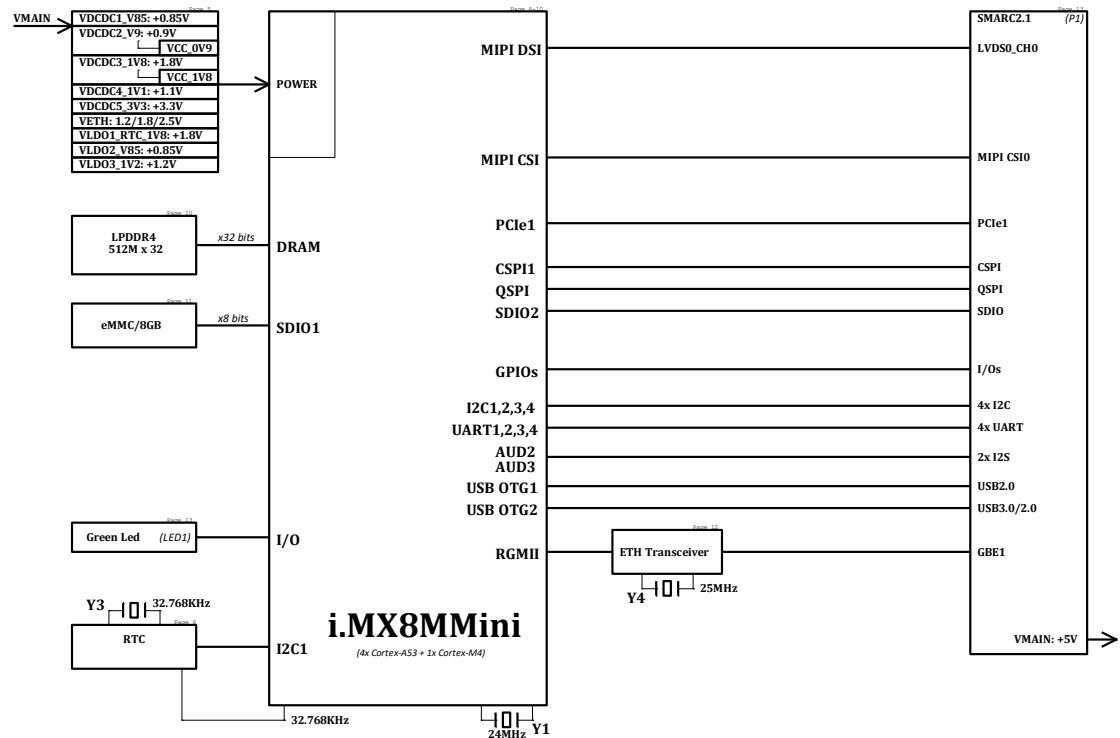
Chapter 2

Hardware Configuration

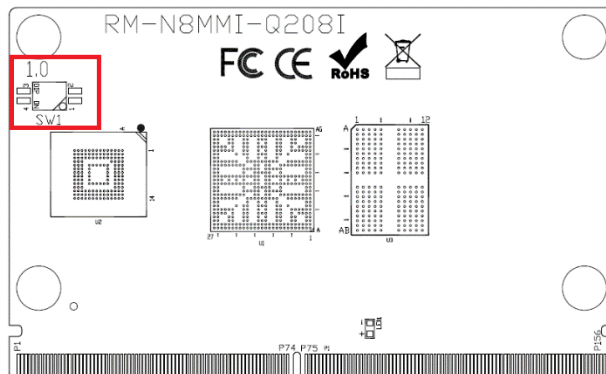
This section contains general information about:

- Block Diagram
- Boot Mode Selection
- Module Outline
- Carrier Board Connector PCB Footprint
- Module Pin Assignments
- Signal Direction and Type Definitions

2.1 Block Diagram



2.2 Boot Mode Selection



Mode	Signal Name	
	SW1_1-4	SW1_2-3
Normal Boot	OFF	OFF
SD Boot	OFF	ON
USB Download	ON	N/A

2.5 Module Pin Assignments

Pin	Assignment	Pin	Assignment
P1	SMB_ALT_B/GPIO3_14	S1	I2C2_SCL
P2	GND	S2	I2C2_SDA
P3	CSI_CKP	S3	GND
P4	CSI_CKN	S4	NC
P5	NC	S5	NC
P6	NC	S6	CLKO1_CSI_MCLK
P7	CSI_DP0	S7	NC
P8	CSI_DN0	S8	CSI_P1_CKP
P9	GND	S9	CSI_P1_CKN
P10	CSI_DP1	S10	GND
P11	CSI_DN1	S11	CSI_P1_DP0
P12	GND	S12	CSI_P1_DN0
P13	CSI_DP2	S13	GND
P14	CSI_DN2	S14	CSI_P1_DP1
P15	GND	S15	CSI_P1_DN1
P16	CSI_DP3	S16	GND
P17	CSI_DN3	S17	NC
P18	GND	S18	NC
P19	RGMII_TRXN3	S19	NC
P20	RGMII_TRXP3	S20	NC
P21	RGMII_LED_10_100	S21	NC
P22	RGMII_LED_1000	S22	NC
P23	RGMII_TRXN2	S23	NC
P24	RGMII_TRXP2	S24	NC
P25	RGMII_LED_ACT	S25	GND
P26	RGMII_TRXN1	S26	NC
P27	RGMII_TRXP1	S27	NC
P28	ETH_AVDDL	S28	NC
P29	RGMII_TRXN0	S29	NC
P30	RGMII_TRXP0	S30	NC
P31	NC	S31	NC
P32	GND	S32	NC
P33	SD2_WP_B	S33	NC
P34	SD2_CMD	S34	GND
P35	SD2_DET_B	S35	NC
P36	SD2_CLK	S36	NC
P37	SD2_PWR/GPIO2_19	S37	USB2_VBUS
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

Pin	Assignment	Pin	Assignment
P43	CSPI1_SS0	S43	ESPI_DQS_B
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	ESPI_CS0_B	S54	GPIO3_17/SD3_CLK
P55	ESPI_CS1_B	S55	NC
P56	ESPI_SCLK	S56	QSPI_IO_2/SD3_DATA2
P57	QSPI_IO_1/SD3_DATA1	S57	QSPI_IO_3/SD3_DATA3
P58	QSPI_IO_0/SD3_DATA0	S58	ECSPI2_RST_B/GPIO3_02
P59	GND	S59	NC
P60	USB1_DP	S60	NC
P61	USB1_DN	S61	GND
P62	USBOTG1_OC_B/GPIO1_13	S62	NC
P63	USBOTG_5V	S63	NC
P64	USB1_ID	S64	GND
P65	NC	S65	NC
P66	NC	S66	NC
P67	NC	S67	GND
P68	GND	S68	USB2_DP
P69	NC	S69	USB2_DN
P70	NC	S70	GND
P71	USBOTG1_PWR/GPIO1_12	S71	NC
P72	NC	S72	NC
P73	NC	S73	GND
P74	USBOTG2_OC_B/GPIO1_15	S74	NC
P75	M2_RST_B/GPIO3_00	S75	NC
P76	NC	S76	PCIe_RST_B/GPIO3_01
P77	NC	S77	NC
P78	NC	S78	NC
P79	GND	S79	NC
P80	NC	S80	GND
P81	NC	S81	NC
P82	GND	S82	NC
P83	PCIe_CLK_P	S83	GND
P84	PCIe_CLK_N	S84	NC
P85	GND	S85	NC
P86	PCIe_RX_P	S86	GND

Pin	Assignment	Pin	Assignment
P87	PCle_RX_N	S87	NC
P88	GND	S88	NC
P89	PCle_TX_P	S89	GND
P90	PCle_TX_N	S90	NC
P91	GND	S91	NC
P92	NC	S92	GND
P93	NC	S93	NC
P94	GND	S94	NC
P95	NC	S95	NC
P96	NC	S96	NC
P97	GND	S97	NC
P98	NC	S98	NC
P99	NC	S99	NC
P100	GND	S100	NC
P101	NC	S101	GND
P102	NC	S102	NC
P103	GND	S103	NC
P104	NC	S104	USB2_ID
P105	NC	S105	NC
P106	NC	S106	NC
P107	NC	S107	LVDS_BL_PWEN/GPIO4_11
P108	CSI1_PWEN_B/GPIO3_25	S108	NC
P109	CSI2_PWEN_B/GPIO3_20	S109	NC
P110	CSI1_RST_B/GPIO3_19	S110	GND
P111	CSI2_RST_B/GPIO3_21	S111	NC
P112	HDA_RST_B/GPIO1_09	S112	NC
P113	PWM3_OUT/GPIO5_03	S113	NC
P114	TACHIN/GPIO5_05	S114	NC
P115	CODEC_INT_B/GPIO4_29	S115	NC
P116	VDCDC_5V_EN/GPIO1_03	S116	LVDS_EN/GPIO4_22
P117	TP_INT_B/GPIO4_10	S117	NC
P118	TP_RST_B/GPIO4_27	S118	NC
P119	TP_EN_B/GPIO4_21	S119	GND
P120	GND	S120	NC
P121	I2C4_SCL	S121	NC
P122	I2C4_SDA	S122	LVDS_BL_PWM/PWMO2
P123	BOOT_SEL0/GPIO1_05	S123	NC
P124	BOOT_SEL1/GPIO1_06	S124	GND
P125	NC	S125	DSI_DP0
P126	RESET_OUT_B	S126	DSI_DN0
P127	RESET_IN_B	S127	LCD_BL_PWEN/GPIO4_28
P128	ONOFF_B	S128	DSI_DP1
P129	UART2_TXD	S129	DSI_DN1
P130	UART2_RXD	S130	GND

Pin	Assignment	Pin	Assignment
P131	UART2_RTS	S131	DSI_DP2
P132	UART2_CTS	S132	DSI_DN2
P133	GND	S133	LCD_EN/GPIO4_01
P134	UART3_TXD	S134	DSI_CKP
P135	UART3_RXD	S135	DSI_CKN
P136	UART4_TXD	S136	GND
P137	UART4_RXD	S137	DSI_DP3
P138	UART4_RTS	S138	DSI_DN3
P139	UART4_CTS	S139	I2C1_SCL
P140	UART1_TXD	S140	I2C1_SDA
P141	UART1_RXD	S141	LCD_BL_PWM/PWMO1
P142	GND	S142	NC
P143	NC	S143	GND
P144	NC	S144	NC
P145	NC	S145	WDOG1_OUTPUT_B
P146	NC	S146	PCIe_WAKE_B/GPIO3_06
P147	VMAIN	S147	LI_CELL
P148	VMAIN	S148	LID_B/GPIO3_18/SD3_CMD
P149	VMAIN	S149	SLEEP_B/GPIO3_16
P150	VMAIN	S150	VIN_PWR_BAD_B
P151	VMAIN	S151	CHARGING_B/GPIO3_07
P152	VMAIN	S152	CHR_PRSNT_B/GPIO3_08/SD3_CD_B
P153	VMAIN	S153	SYSTEM_STBY_B
P154	VMAIN	S154	PMIC_ON_REQ
P155	VMAIN	S155	F_RECOV_B/GPIO3_09/SD3_WP_B
P156	VMAIN	S156	BATTERY_LOW_B/GPIO1_00
		S157	AT_DET_B/GPIO4_20
		S158	GND

2.6 Signal Direction and Type Definitions

Pin	Signal Name	Description	I/O Type	I/O Level	PU / PD	Comments
P1	SMB_ALT_B/GPIO3_14	SMBus Interrupt Signal	I CMOS	1.8V		Can use as GPIO
P2	GND	Ground	Analog	Ground	-	
P3	CSI_CKP	CSI1 differential clock input	I D-PHY	-	-	
P4	CSI_CKN					
P5	NC	Not Connect	-	-	-	-
P6	NC	Not Connect	-	-	-	-
P7	CSI_DP0	CSI1 differential input	I D-PHY	-	-	
P8	CSI_DN0					
P9	GND	Ground	Analog	Ground	-	
P10	CSI_DP1	CSI1 differential input	I D-PHY	-	-	
P11	CSI_DN1					
P12	GND	Ground	Analog	Ground	-	

Pin	Signal Name	Description	I/O Type	I/O Level	PU / PD	Comments
P13	CSI_DP2	CSI1 differential input	I D-PHY	-	-	
P14	CSI_DN2					
P15	GND	Ground	Analog	Ground	-	
P16	CSI_DP3	CSI1 differential input	I D-PHY	-	-	
P17	CSI_DN3					
P18	GND	Ground	Analog	Ground	-	
P19	RGMII_TRXN3	GBE0 Differential Pair Signals for External Transformer	I/O GBE MDI	-	-	
P20	RGMII_TRXP3					
P21	RGMII_LED_10_100	GBE0 lower link speed LED	O CMOS	2.5V	-	
P22	RGMII_LED_1000	GBE0 maximum link speed LED	O CMOS	2.5V	-	
P23	RGMII_TRXN2	GBE0 Differential Pair Signals for External Transformer	I/O GBE MDI	-	-	
P24	RGMII_TRXP2					
P25	RGMII_LED_ACT	Link/Activity Indication LED	O CMOS	2.5V	-	
P26	RGMII_TRXN1	GBE0 Differential Pair Signals for External Transformer	I/O GBE MDI	-	-	
P27	RGMII_TRXP1					
P28	ETH_AVDDL	GBE0 analog supply	Analog	2.5V	-	
P29	RGMII_TRXN0	GBE0 Differential Pair Signals for External Transformer	I/O GBE MDI	-	-	
P30	RGMII_TRXP0					
P31	NC	Not Connect	-	-	-	
P32	GND	Ground	Analog	Ground	-	
P33	SD2_WP_B	SD I/F: I/O-WP detect, Active Low	Input	1.8/3.3V	-	Can use as GPIO
P34	SD2_CMD	SDIO Command/Response	I/O CMOS	1.8/3.3V	-	Can use as GPIO
P35	SD2_DET_B	SDIO Card Detect	I/O CMOS	1.8/3.3V	-	Can use as GPIO
P36	SD2_CLK	SDIO Clock	I/O CMOS	1.8/3.3V	-	Can use as GPIO
P37	SD2_PWR/GPIO2_19	SDIO Power Enable	I/O CMOS	1.8/3.3V	-	Can use as GPIO
P38	GND	Ground	Analog	Ground	-	
P39	SD2_DATA0	SDIO Data lines	I/O CMOS	1.8/3.3V	-	Can use as GPIO
P40	SD2_DATA1					
P41	SD2_DATA2					
P42	SD2_DATA3					
P43	CSPI1_SS0					
P44	CSPI1_SCLK	SPI Clock	O CMOS	1.8V	-	Can use as GPIO
P45	CSPI1_MISO	SPI Master input/Slave output	I CMOS	1.8V	-	Can use as GPIO
P46	CSPI1_MOSI	SPI Master output/Slave input	O CMOS	1.8V	-	Can use as GPIO
P47	GND	Ground	Analog	Ground	-	
P48	NC	Not Connect	-	-	-	
P49	NC	Not Connect	-	-	-	
P50	GND	Ground	Analog	Ground	-	
P51	NC	Not Connect	-	-	-	
P52	NC	Not Connect	-	-	-	
P53	GND	Ground	Analog	Ground	-	
P54	ESPI_CS0_B	QSPI Master Chip Select 0	O CMOS	1.8V	-	Can use as GPIO
P55	ESPI_CS1_B	QSPI Master Chip Select 1	O CMOS	1.8V	-	Can use as GPIO

Pin	Signal Name	Description	I/O Type	I/O Level	PU / PD	Comments
P56	ESPI_SCLK	QSPI Clock	O CMOS	1.8V	-	Can use as GPIO
P57	QSPI_IO_1/SD3_DATA1	QSPI Master Data Input / Output 1	I/O CMOS	1.8V	-	Can use as GPIO
P58	QSPI_IO_0/SD3_DATA0	QSPI Master Data Input / Output 0	I/O CMOS	1.8V	-	Can use as GPIO
P59	GND	Ground	Analog	Ground	-	
P60	USB1_DP	USB Differential Data Pairs for Port 1	I/O USB	USB	-	
P61	USB1_DN					
P62	USBOTG1_OC_B/GPIO1_13	USB Over-Current Sense for Port 1	I/O CMOS	1.8V	-	Can use as GPIO
P63	USBOTG_5V	USB Port 1 Host Power Detection	I USB VBUS 5V	USB VBUS 5V	-	
P64	USB1_ID	Input Pin to Announce OTG1 Device Insertion on USB 2.0 Port	I CMOS	1.8V	-	
P65	NC	Not Connect	-	-	-	
P66	NC	Not Connect	-	-	-	
P67	NC	Not Connect	-	-	-	
P68	GND	Ground	Analog	Ground	-	
P69	NC	Not Connect	-	-	-	
P70	NC	Not Connect	-	-	-	
P71	USBOTG1_PWR/GPIO1_12	USB Over-Current Sense for Port 2 or Power enable for Port 1	I/O CMOS	1.8V	-	Can use as GPIO
P72	NC	Not Connect	-	-	-	
P73	NC	Not Connect	-	-	-	
P74	USBOTG2_OC_B/GPIO1_15	USB2 Over-Current Detect	I/O CMOS	1.8V	-	Can use as GPIO
P75	M2_RST_B/GPIO3_00	PCIe Port/M.2 reset output	I/O CMOS	1.8V	-	Can use as GPIO
P76	NC	Not Connect	-	-	-	
P77	NC	Not Connect	-	-	-	
P78	NC	Not Connect	-	-	-	
P79	GND	Ground	Analog	Ground	-	
P80	NC	Not Connect	-	-	-	
P81	NC	Not Connect	-	-	-	
P82	GND	Ground	Analog	Ground	-	
P83	PCIe_CLK_P	Differential PCIe Link reference clock output	O PCIE	-	-	
P84	PCIe_CLK_N					
P85	GND	Ground	Analog	Ground	-	
P86	PCIe_RX_P	Differential PCIe link receive data pair	I PCIE	-	-	
P87	PCIe_RX_N					
P88	GND	Ground	Analog	Ground	-	
P89	PCIe_TX_P	Differential PCIe link transmit data pair	O PCIE	-	-	
P90	PCIe_TX_N					
P91	GND	Ground	Analog	Ground	-	
P92	NC	Not Connect	-	-	-	
P93	NC	Not Connect	-	-	-	
P94	GND	Ground	Analog	Ground	-	
P95	NC	Not Connect	-	-	-	
P96	NC	Not Connect	-	-	-	
P97	GND	Ground	Analog	Ground	-	

Pin	Signal Name	Description	I/O Type	I/O Level	PU / PD	Comments
P98	NC	Not Connect	-	-	-	
P99	NC	Not Connect	-	-	-	
P100	GND	Ground	Analog	Ground	-	
P101	NC	Not Connect	-	-	-	
P102	NC	Not Connect	-	-	-	
P103	GND	Ground	Analog	Ground	-	
P104	NC	Not Connect	-	-	-	
P105	NC	Not Connect	-	-	-	
P106	NC	Not Connect	-	-	-	
P107	NC	Not Connect	-	-	-	
P108	CSI1_PWEN_B/GPIO3_25	Camera 0 Power Enable, active low output	O CMOS	1.8V	-	Can use as GPIO
P109	CSI2_PWEN_B/GPIO3_20	Camera 1 Power Enable, active low output	O CMOS	1.8V	-	Can use as GPIO
P110	CSI1_RST_B/GPIO3_19	Camera 0 reset, active low output	O CMOS	1.8V	-	Can use as GPIO
P111	CSI2_RST_B/GPIO3_21	Camera 1 reset, active low output	O CMOS	1.8V	-	Can use as GPIO
P112	HDA_RST_B/GPIO1_09	High-Definition Audio Reset Output to Codec, low active	O CMOS	1.8V	-	Can use as GPIO
P113	PWM3_OUT/GPIO5_03	GPIO Pin 5 Preferred Output	I/O CMOS	1.8V	-	Can use as GPIO
P114	TACHIN/GPIO5_05	GPIO Pin 6 Preferred Input	I/O CMOS	1.8V	-	Can use as GPIO
P115	CODEC_INT_B/GPIO4_29	GPIO Pin 7 Preferred Input	I/O CMOS	1.8V	-	Can use as GPIO
P116	VDCDC_5V_EN/GPIO1_03	GPIO Pin 8 Preferred Input	I/O CMOS	1.8V	-	Can use as GPIO
P117	TP_INT_B/GPIO4_10	GPIO Pin 9 Preferred Input	I/O CMOS	1.8V	-	Can use as GPIO
P118	TP_RST_B/GPIO4_27	GPIO Pin 10 Preferred Input	I/O CMOS	1.8V	-	Can use as GPIO
P119	TP_EN_B/GPIO4_21	GPIO Pin 11 Preferred Input	I/O CMOS	1.8V	-	Can use as GPIO
P120	GND	Ground	Analog	Ground	-	
P121	I2C4_SCL	I2C4 bus CLK	I/O OD CMOS	1.8V	PU 2k2	
P122	I2C4_SDA	I2C4 bus SDA	I/O OD CMOS	1.8V	PU 2k2	
P123	BOOT_SEL0/GPIO1_05	Input straps determine the Module boot device.	I/O CMOS	1.8V	-	Can use as GPIO
P124	BOOT_SEL1/GPIO1_06	Input straps determine the Module boot device.	I/O CMOS	1.8V	-	Can use as GPIO
P125	NC	Not Connect	-	-	-	
P126	RESET_OUT_B	General purpose reset output, active low	O OD CMOS	1.8/3.3V	-	
P127	RESET_IN_B	Module Reset input, active low	I OD CMOS	1.8/3.3V	-	
P128	ONOFF_B	Power-button input, active low	I OD CMOS	1.8V	PU 100k	
P129	UART2_TXD	Serial Data Output Port 2	O CMOS	1.8V	-	Can use as GPIO
P130	UART2_RXD	Serial Data input Port 2	I CMOS	1.8V	-	Can use as GPIO
P131	UART2_RTS	Request to Send for Port 2	O CMOS	1.8V	-	Can use as GPIO
P132	UART2_CTS	Clear to Send for Port 2	I CMOS	1.8V	-	Can use as GPIO
P133	GND	Ground	Analog	Ground	-	
P134	UART3_TXD	Serial Data Output Port 3	O CMOS	1.8V	-	Can use as GPIO
P135	UART3_RXD	Serial Data input Port 3	I CMOS	1.8V	-	Can use as GPIO

Pin	Signal Name	Description	I/O Type	I/O Level	PU / PD	Comments
P136	UART4_TXD	Serial Data Output Port 4	O CMOS	1.8V	-	Can use as GPIO
P137	UART4_RXD	Serial Data input Port 4	I CMOS	1.8V	-	Can use as GPIO
P138	UART4_RTS	Request to Send for Port 4	O CMOS	1.8V	-	Can use as GPIO
P139	UART4_CTS	Clear to Send for Port 4	I CMOS	1.8V	-	Can use as GPIO
P140	UART1_TXD	Serial Data Output Port 1	O CMOS	1.8V	-	
P141	UART1_RXD	Serial Data input Port 1	I CMOS	1.8V	-	
P142	GND	Ground	Analog	Ground	-	
P143	NC	Not Connect	-	-	-	
P144	NC	Not Connect	-	-	-	
P145	NC	Not Connect	-	-	-	
P146	NC	Not Connect	-	-	-	
P147	VMAIN	Module power input, 3.5-5.25V	Analog	3.5-5.25V		
P148	VMAIN					
P149	VMAIN					
P150	VMAIN					
P151	VMAIN					
P152	VMAIN					
P153	VMAIN					
P154	VMAIN					
P155	VMAIN					
P156	VMAIN					
S1	I2C2_SCL	I2C2 bus CLK	I/O OD CMOS	1.8V	PU 2k2	
S2	I2C2_SDA	I2C2 bus SDA	I/O OD CMOS	1.8V	PU 2k2	
S3	GND	Ground	Analog	Ground	-	
S4	NC	Not Connect	-	-	-	
S5	NC	Not Connect	-	-	-	
S6	CLKO1_CSI_MCLK	Master clock output	O CMOS	1.8V	-	Can use as GPIO
S7	NC	Not Connect	-	-	-	
S8	CSI_P1_CKP	CSI0 differential clock input	I D-PHY	-	-	
S9	CSI_P1_CKN					
S10	GND	Ground	-	-	-	
S11	CSI_P1_DP0	CSI0 differential input	I D-PHY	-	-	
S12	CSI_P1_DN0					
S13	GND	Ground	-	-	-	
S14	CSI_P1_DP1	CSI0 differential input	I D-PHY	-	-	
S15	CSI_P1_DN1					
S16	GND	Ground	Analog	Ground	-	
S17	NC	Not Connect	-	-	-	
S18	NC					
S19	NC	Not Connect	-	-	-	
S20	NC	Not Connect	-	-	-	
S21	NC					
S22	NC	Not Connect	-	-	-	
S23	NC	Not Connect	-	-	-	
S24	NC					
S25	GND	Ground	Analog	Ground	-	

Pin	Signal Name	Description	I/O Type	I/O Level	PU / PD	Comments
S26	NC	Not Connect	-	-	-	
S27	NC					
S28	NC	Not Connect	-	-	-	
S29	NC	Not Connect	-	-	-	
S30	NC	Not Connect	-	-	-	
S31	NC	Not Connect	-	-	-	
S32	NC	Not Connect	-	-	-	
S33	NC	Not Connect	-	-	-	
S34	GND	Ground	Analog	Ground	-	
S35	NC	Not Connect	-	-	-	
S36	NC	Not Connect	-	-	-	
S37	USB2_VBUS	USB Port 2 Host Power Detection	I USB VBUS 5V	5V	-	
S38	AP_CODEC_MCLK	Master Clock Output to I2S Codec	O CMOS	1.8V	-	Can use as GPIO
S39	AP_AUD3_TXFS	I2S1 Left & Right Synchronization Clock	I/O CMOS	1.8V	-	Can use as GPIO
S40	AP_AUD3_TXD	I2S1 Digital Audio Output	O CMOS	1.8V	-	Can use as GPIO
S41	AP_AUD3_RXD	I2S1 Digital Audio Input	I CMOS	1.8V	-	Can use as GPIO
S42	AP_AUD3_TXC	I2S1 Digital Audio Clock	I/O CMOS	1.8V	-	Can use as GPIO
S43	ESPI_DQS_B	QSPI ALERT	I CMOS	1.8V	-	Can use as GPIO
S44	NC	Not Connect	-	-	-	
S45	NC	Not Connect	-	-	-	
S46	NC	Not Connect	-	-	-	
S47	GND	Ground	Analog	Ground	-	
S48	I2C3_SCL	I2C3 bus CLK	I/O OD CMOS	1.8V	PU 2k2	
S49	I2C3_SDA	I2C3 bus SDA	I/O OD CMOS	1.8V	PU 2k2	
S50	HDA_AUD2_TXFS	I2S3 Left & Right Synchronization Clock	I/O CMOS	1.8V	-	Can use as GPIO
S51	HDA_AUD2_TXD	I2S3 Digital Audio Output	O CMOS	1.8V	-	Can use as GPIO
S52	HDA_AUD2_RXD	I2S3 Digital Audio Input	I CMOS	1.8V	-	Can use as GPIO
S53	HDA_AUD2_TXC	I2S3 Digital Audio Clock	I/O CMOS	1.8V	-	Can use as GPIO
S54	GPIO3_17/SD3_CLK	GPIO	I/O CMOS	1.8V	-	Can use as GPIO
S55	NC	Not Connect	-	-	-	
S56	QSPI_IO_2/SD3_DATA2	QSPI Master Data Input /Output 2	I/O CMOS	1.8V	-	Can use as GPIO
S57	QSPI_IO_3/SD3_DATA3	QSPI Master Data Input /Output 3	I/O CMOS	1.8V	-	Can use as GPIO
S58	ECSPI2_RST_B/GPIO3_02	QSPI Master Data Input /Output	I/O CMOS	1.8V	-	Can use as GPIO
S59	NC	Not Connect	-	-	-	
S60	NC	Not Connect	-	-	-	
S61	GND	Ground	Analog	Ground	-	
S62	NC	Not Connect	-	-	-	
S63	NC					
S64	GND	Ground	Analog	Ground	-	
S65	NC	Not Connect	-	-	-	
S66	NC					
S67	GND	Ground	Analog	Ground	-	

Pin	Signal Name	Description	I/O Type	I/O Level	PU / PD	Comments
S68	USB2_DP	USB Differential Data Pairs for Port 2	I/O USB	USB	-	
S69	USB2_DN					
S70	GND	Ground	Analog	Ground	-	
S71	NC	Not Connect	-	-	-	
S72	NC					
S73	GND	Ground	Analog	Ground	-	
S74	NC	Not Connect	-	-	-	
S75	NC					
S76	PCIe_RST_B/GPIO3_01	PCIe reset output	O CMOS	1.8V	-	Can use as GPIO
S77	NC	Not Connect	-	-	-	
S78	NC	Not Connect	-	-	-	
S79	NC					
S80	GND	Ground	Analog	Ground	-	
S81	NC	Not Connect	-	-	-	-
S82	NC					
S83	GND	Ground	Analog	Ground	-	
S84	NC	Not Connect	-	-	-	
S85	NC					
S86	GND	Ground	Analog	Ground	-	
S87	NC	Not Connect	-	-	-	
S88	NC					
S89	GND	Ground	Analog	Ground	-	
S90	NC	Not Connect	-	-	-	
S91	NC					
S92	GND	Ground	Analog	Ground	-	
S93	NC	Not Connect	-	-	-	
S94	NC	Not Connect	-	-	-	
S95	NC	Not Connect	-	-	-	
S96	NC	Not Connect	-	-	-	
S97	NC	Not Connect	-	-	-	
S98	NC	Not Connect	-	-	-	
S99	NC	Not Connect	-	-	-	
S100	NC	Not Connect	-	-	-	
S101	GND	Ground	Analog	Ground	-	
S102	NC	Not Connect	-	-	-	
S103	NC	Not Connect	-	-	-	
S104	USB2_ID	Input Pin to Announce OTG2 Device Insertion on USB 2.0 Port	I CMOS	1.8V	-	
S105	NC	Not Connect	-	-	-	
S106	NC	Not Connect	-	-	-	
S107	LVDS_BL_PWEN/GPIO4_11	LVDS1 Backlight Enable	O CMOS	1.8V	-	Can use as GPIO
S108	NC	Not Connect	-	-	-	
S109	NC					
S110	GND	Ground	Analog	Ground	-	
S111	NC	Not Connect	-	-	-	
S112	NC					
S113	NC	Not Connect	-	-	-	

Pin	Signal Name	Description	I/O Type	I/O Level	PU / PD	Comments
S114	NC	Not Connect	-	-	-	
S115	NC					
S116	LVDS_EN/GPIO4_22	LVDS1 Power Enable	O CMOS	1.8V	-	Can use as GPIO
S117	NC	Not Connect	-	-	-	
S118	NC					
S119	GND	Ground	Analog	Ground	-	
S120	NC	Not Connect	-	-	-	
S121	NC					
S122	LVDS_BL_PWM/PWMO2	LVDS1 Brightness Control	O CMOS	1.8V	-	Can use as GPIO
S123	NC	Not Connect	-	-	-	
S124	GND	Ground	Analog	Ground	-	
S125	DSI_DP0	DSI/LVDS0 Differential Pair Data0 Lines	O D-PHY/ LVDS	-	-	
S126	DSI_DN0					
S127	LCD_BL_PWEN/GPIO4_28	DSI/LVDS0 Backlight Enable	O CMOS	1.8V	-	Can use as GPIO
S128	DSI_DP1	DSI/LVDS0 Differential Pair Data1 Lines	O D-PHY/ LVDS	-	-	
S129	DSI_DN1					
S130	GND	Ground	Analog	Ground	-	
S131	DSI_DP2	DSI/LVDS0 Differential Pair Data2 Lines	O D-PHY/ LVDS	-	-	
S132	DSI_DN2					
S133	LCD_EN/GPIO4_01	DSI/LVDS0 Power Enable	O CMOS	1.8V	-	Can use as GPIO
S134	DSI_CKP	DSI/LVDS0 Differential Pair Clock Lines	O D-PHY/ LVDS	-	-	
S135	DSI_CKN					
S136	GND	Ground	Analog	Ground	-	
S137	DSI_DP3	DSI/LVDS0 Differential Pair Data3 Lines	O D-PHY/ LVDS	-	-	
S138	DSI_DN3					
S139	I2C1_SCL	I2C1 bus CLK	I/O OD CMOS	1.8V	PU 2k2	
S140	I2C1_SDA	I2C1 bus SDA	I/O OD CMOS	1.8V	PU 2k2	
S141	LCD_BL_PWM/PWMO1	LVDS1 Brightness Control	O CMOS	1.8V	-	Can use as GPIO
S142	NC	Not Connect	-	-	-	
S143	GND	Ground	Analog	Ground	-	
S144	NC	Not Connect	-	-	-	
S145	WDOG1_OUTPUT_B	Watch-Dog-Timer Output, low active	O CMOS	1.8V	-	
S146	PCIe_WAKE_B/GPIO3_06	PCIe wake up interrupt to host –common to PCIe	I CMOS	1.8V	-	Can use as GPIO
S147	LI_CELL	Low current RTC circuit backup power	Analog	2~3.3V	-	
S148	LID_B/GPIO3_18/SD3_CMD	Lid open/close indication to Module	I CMOS	1.8V	-	Can use as GPIO
S149	SLEEP_B/GPIO3_16	Sleep indicator from Carrier Board	I CMOS	1.8V	-	Can use as GPIO
S150	VIN_PWR_BAD_B	Power bad indication from Carrier Board	I OD CMOS	1.8~5V	-	
S151	CHARGING_B/GPIO3_07	Held low by Carrier during battery charging	I CMOS	1.8V	-	Can use as GPIO
S152	CHR_PRSN_T_B/GPIO3_08/SD3_CD_B	Held low by Carrier if DC input for battery	I CMOS	1.8V	-	Can use as GPIO
S153	SYSTEM_STBY_B	Module Standby State Output	O OD CMOS	3.3V	-	
S154	PMIC_ON_REQ	Carrier PWR_ON Output	O CMOS	3.3V	-	

Pin	Signal Name	Description	I/O Type	I/O Level	PU / PD	Comments
S155	F_RECOV_B/GPIO3_09/SD3_WP_B	Recovery mode Detect	I CMOS	1.8V	-	Can use as GPIO
S156	BATTERY_LOW_B/GPIO1_00	Battery low indication / 32.768KHz Output	I/O CMOS	1.8V	-	Can use as GPIO
S157	AT_DET_B/GPIO4_20	PCBA autotest detect	I CMOS	1.8V	-	Can use as GPIO
S158	GND	Ground	Analog	Ground	-	

2.7 Layout Recommendations

Signal impedance recommendation

Signal Group	Impedance	Tolerance (±)
All signals, unless specified	50 Ω Single End	10%
PCIE_TX/RX Diff signals	85 Ω Differential	10%
USB Diff signals	90 Ω Differential	10%
Diff signals: LVDS, SATA, HDMI, DDR, PCIE_CLK, MIPI (CSI & DSI), MLB, PHY IC to Ethernet Connector	100 Ω Differential	10%

PCB stack up and trace width/space recommendation

L1. Top signals
L2. GND
L3. Int1 signals
L4. Int2 signals
L5. Power
L6. Bottom signals

Micro strip

Layer	Trace width/space	Single-End	Differential
1,6	5.5	50 +/- 10 %	
1,6	4.5/4/4.5		85 +/- 10 %
1,6	4/4.5/4		90 +/- 10 %
1,6	4/7/4		100 +/- 10 %

Strip line

Layer	Trace width/space	Single-End	Differential
3,4	5.5	50 +/- 10 %	
3,4	4.5/4/4.5		85 +/- 10 %
3,4	4/4.5/4		90 +/- 10 %
3,4	4/7/4		100 +/- 10 %

Layer	Glass Style & Cu Wt.	Thickness (mil)
L1	0.5OZ plating to 1OZ	1.4
P.P	3313	3.6
L2	0.5OZ	0.65

2 Hardware Configuration

CORE	0.102 FR-4	4
L3	0.5OZ	0.65
P.P	7628	7.1
CORE	0.71 FR-4	28
P.P	7628	7.1
L4	0.5OZ	0.65
CORE	0.102 FR-4	4
L5	0.5OZ	0.65
P.P	3313	3.6
L6	0.5OZ plating to 1OZ	1.4

Total thickness 62.8mil 1.595mm

Chapter 3

Software Setup

- Make a recovery SD card
- Upgrade firmware through the recovery SD card

3.1 Make a Recovery SD Card and Recovery from SD Card

This is for advanced users with IBASE standard image file only.

3.1.1 Make a Recovery SD Card

1. Set the board to download mode (sw1-A on)
2. Download sd recovery image (e.g. IBASE-RM-N8MMI_SMC-sd-recovery-20210222-180140)
3. Push in an SD Card (4G or more) into RP-113 SD slot
4. Power on
5. Run "FW Download SDCard.bat" on sd recovery image
6. Wait to finish

3.1.2 Upgrade Firmware through the Recovery SD Card

1. Create directory "/hmsupdate/yocto" to USB flash disk p1 root.
2. Copy release files to "/hmsupdate/yocto"

```
imx-boot-imx8mmevk-sd.bin-flash_evk  
fsl-imx8mm-evk.dtb  
Image  
rootfs.tar.bz2  
recovery.tar.bz2
```

3. Plug 3.1.1 recovery SD card and 3.1.2 USB flash disk into RP-113.
4. Power up the board and the recovery program will start.
5. When recovery is done, power down the board, and pull out the recovery SD card.

3.2 Display Parameter Setting in Kernel

RM-N8MMI supports 21.5" LVDS (LG LM215WF3-SLK1) output by default

Appendix

This chapter contains the following information:

**RP-113 Dimensions
RP-113 I/O View**

B. RP-113 I/O View

