NMQ2210

Hardware Guide

Version:1.1

Date:2024/12/23

Change History

Version	Author	Update Date	Remark
V1.0.0			Initial version
V1.1.0			Update antenna trace

Contents

1 Foreword

1.1 Introduction

The document describes the electrical characteristics, RF performance, dimensions and application environment, etc. of NMQ2210. With the assistance of the document and other instructions, the developers can quickly understand the hardware functions of NMQ2210 modules and develop products.

2 Overview

2.1 introduction

The NMQ2210 module is a 5G module which supports NSA and SA network architectures. The NMQ2210 integrates core devices such as Baseband, Memory, PMU, Transceiver, and PA. It supports 5G NR Sub6, FDD-LTE, TDD-LTE, long-distance communication modes. Supports uplink 2x2 MIMO and downlink 4x4 MIMO multi-antenna configuration in SA mode. It also reserved GNSS wireless positioning technology. The NMQ2210 is designed in M.2 form factor interface, and is suitable for a variety of eMBB scenarios, such as CPE, VR/AR, gateway, TV box, and intelligent monitoring

2.1.1 Key Features

Table 2-1 Key Features

Performance	Description
Operating Band	LTE FDD: Band 2/4/5/12/13/14/29/30/41/48/66/71
	NR: n2/5/12/14/25/30/41/48/70/66/71/77
NR	3GPP Release 16
LTE	3GPP Release 16
Feature	NR: DL 4*4 MIMO: n2/25/30/41/48/66/70/77 DL 2*2 MIMO: n5/12/14/29/71 UL 2*2 MIMO: n41/48/77 LTE: DL 4*4MIMO: B2/4/30/41/48/66 DL 2*2MIMO: B5/12/13/14/29/71

Performance	Description	
	NSA and SA supported	
	SRS: n41, n77 Support: 1T2R, 1T4R, 2T4R	
	HPUE: n41.n77	
Data Transmission	SA 5G/NR Sub-6 Peak	2.47Gbps(DL) / 900Mbps(UL)
	NSA Peak	3.47Gbps(DL) / 555Mbps(UL)
	LTE	1.6Gbps(DL) / 211Mbps(UL)
Power Supply	DC: 3.4~4.4V, typical voltage: 3.8V	
Antenna Type	External	
Antenna Gain	<4dBi	
Temperature	Normal operating temperature: -30-70°C Storage temperature: -40-85°C	
Physical characteristics	Dimension: 52mm*37.4mm*2.3mm Package: M.2 Weight: about：10g	
CPU	ARM Cortex-A7, Quad core, up to 1.5GHz	
Memory	4Gb LPDDR4X + 4Gb NAND Flash	

Performance	Description
Interface	
USB Interface	USB 3.0, rate up to 10Gbps
PCIe Interface	PCIe Interface: PCIe Gen3 1-lane or PCIe Gen4 1-lane (RC only)
SIM Interface	Dual SIM: 1.8V/3V SIM1: USIM SIM2: ESIM/USIM
Software	
Firmware update	USB/PCIe/FOTA
Operating System	Linux/Android/Windows

Note:

1. When temperature keeps in the range of -30~70°C, the module can work normally. Module performance meets the 3GPP specifications.

2.2 Antenna Configuration

Antenna	Freq.(MHz)	Mode	Band	Band Freq.(MHz)	Remark
ANT0	617-894	FDD	B5(n5)	TX0:824-849	LB TX0/PRX
				PRX:869-894	
			B12(n12)	TX0:699-716	
				PRX:729-746	
			B13	TX0:777-787	
				PRX:746-756	
			B14(n14)	TX0:788-798	
				PRX:758-768	
			B29(n29) DL only	PRX:717-728	
			B71(n71)	TX0:663-698	
				PRX:617-652	
	1695 - 2690	FDD	B2(n2)	TX0:1850-1910	MHB TX0/PRX
				PRX:1930-1990	
			B4	TX0:1710-1755	
				PRX:2110-2155	
			B25(n25)	TX0:1850-1915	
				PRX:1930-1995	
			B66(n66)	TX0:1710–1780	
				PRX:2110–2200	
			B30(n30)	TX0:2305-2315	
				PRX:2350-2360	
			n70	TX0:1695– 1710	
				PRX:1995– 2020	
		TDD	B41(n41)	TX0:2496-2690	
				PRX:2496-2690	
	3300-4200	TDD	B48(n48)	TX1:3550 - 3700	UHB TX1/DRX
				DRX:3550 - 3700	
			n77	TX1:3300 – 4200	
				DRX:3300 – 4200	
ANT1	617-894	FDD	B5(n5)	DRX:869-894	LB DRX
			B12(n12)	DRX:729-746	
			B13	DRX:746-756	
			B14(n14)	DRX:758-768	
			B29(n29) DL only	DRX:717-728	
			B71(n71)	DRX:617-652	
	1930 – 2690	FDD	B2(n2)	MIMO PRX:1930-1990	MHB MIMO PRX
			B4	MIMO PRX:2110-2155	
			B25(n25)	MIMO PRX:1930-1995	
			B30(n30)	MIMO PRX:2350-2360	

	1930 - 2690	FDD	B66(n66)	MIMO PRX:2110–2200	MHB MIMO PRX
			n70	MIMO PRX:1995– 2020	
		TDD	B41(n41)	MIMO PRX:2496-2690	
	3300-4200	TDD	B48(n48)	MIMO DRX:3550 - 3700	UHB MIMO DRX
			n77	MIMO DRX:3300 – 4200	
	GNSS	GNSS	L1	1559-1606	GPS_L1
ANT2	1930- 2690	FDD	B2(n2)	DRX:1930-1990	MHB DRX
			B4	DRX:2110-2155	
			B25(n25)	DRX:1930-1995	
			B30(n30)	DRX:2350-2360	
			B66(n66)	DRX:2110–2200	
			n70	DRX:1995– 2020	
		TDD	B41(n41)	DRX:2496-2690	
	3300-4200	TDD	B48(n48)	MIMO PRX:3550 - 3700	UHB MIMO PRX
			n77	MIMO PRX:3300 – 4200	
ANT3	1965 - 2690	FDD	B2(n2)	TX1:1850-1910	MHB TRX1/MIMO DRX
				MIMO DRX:1930-1990	
			B4	TX1:1710-1755	
				MIMO DRX:2110-2155	
			B25(n25)	TX1:1850-1915	
				MIMO DRX:1930-1995	
			B66(n66)	TX1:1710–1780	
				MIMO DRX:2110–2200	
			B30(n30)	TX1:2305-2315	
				MIMO DRX:2350-2360	
			n70	TX1:1695– 1710	
				MIMO DRX:1995– 2020	
		TDD	B41(n41)	TX0:2496-2690	
				MIMO DRX:2496-2690	
	3300-4200	TDD	B48(n48)	TX0:3550 - 3700	UHB TX0/PRX
				PRX:3550 - 3700	
			n77	TX0:3300 – 4200	
				PRX:3300 – 4200	

2.3 Waring

2.3.1 Important Notice to OEM integrators

1. This module is limited to OEM installation ONLY.
2. This module is limited to installation in mobile or fixed applications, according to Part 2.1091(b).
3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations
4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part
15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s).
The Grantee will provide guidance to the host manufacturer for Part 15 B requirements if needed.

2.3.2 Important Note

Notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify to ASKEY that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the USI, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

2.3.3 End Product Labeling

When the module is installed in the host device, the FCC label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: "Contains FCC ID: H8NNMQ2210-D187"

The FCC ID can be used only when all FCC compliance requirements are met.

2.3.4 Antenna Installation

(1) The antenna must be installed such that 20 cm is maintained between the antenna and users,

(2) The transmitter module may not be co-located with any other transmitter or antenna.

(3) Only antennas of the same type and with equal or less gains as shown below may be used with this module. Other types of antennas and/or higher gain antennas may require additional authorization for operation.

Antenna type	Dipole

		Antenna Gain (dBi)
LTE Bands	FDD 2	2.71
	FDD 4	2.71
	FDD 5	0.93
	FDD 12	0.93
	FDD 13	0.93
	FDD 14	0.93
	FDD 29	/
	FDD 30	0.06
	FDD 66	2.71
	FDD 71	0.93
	TDD 41	2.71
	TDD 48	-1.29

		Antenna Gain (dBi)
NR Bands	n2	2.71
	n5	0.93
	n12	0.93
	n14	0.93
	n25	2.71
	n30	0.06
	n66	2.71
	n70	2.71
	n71	0.93
	n41	2.71
	n48	-1.29
	n77	-0.5

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM

integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

The characteristic impedance depends on the dielectric of PCB, the track width and the ground plane spacing. The detail information as below.

| Type	Drill Structure	Layer	Estimated residual copper rate(%)	Material Type	DK (2GHZ)	DF (2GHZ)	Thickness after Process (mil)	Thickness after Process (mm)
ESI P/N:	21042806-00							
		Top Solder Mask			4.1		0.79	0.020
Metal		L1		Cu Foil + Plating			0.94	0.024
Dielectric		Prepreg		1067	3.58	0.015	2.32	0.059
Metal		L2	80.0%	Cu Foil + Plating			0.59	0.015
Dielectric		Prepreg		1067	3.58	0.015	2.32	0.059
Metal		L3	80.0%	Cu Foil + Plating			0.59	0.015
Dielectric		Prepreg		1067	3.58	0.015	2.20	0.056
Metal		L4	80.0%	Cu Foil + Plating			0.79	0.020
Dielectric		Prepreg		1080	3.7	0.014	3.11	0.079
Metal		L5	80.0%	Cu Foil + Plating			0.61	0.016
Dielectric		Core		0.0025"	3.68	0.015	2.52	0.064
Metal		L6	80.0%	Cu Foil + Plating			0.61	0.016
Dielectric		Prepreg		1080	3.7	0.014	3.11	0.079
Metal		L7	80.0%	Cu Foil + Plating			0.79	0.020
Dielectric		Prepreg		1067	3.58	0.015	2.20	0.056
Metal		L8	80.0%	Cu Foil + Plating			0.59	0.015
Dielectric		Prepreg		1067	3.58	0.015	2.32	0.059
Metal		L9	80.0%	Cu Foil + Plating			0.59	0.015
Dielectric		Prepreg		1067	3.58	0.015	2.32	0.059
Metal		L10		Cu Foil + Plating			0.94	0.024
		Bottom Solder Mask			4.1		0.79	0.020
	Board thickness : 0.8+/-0.1mm (Including Plating+S/M)					Total :	31.06	0.789
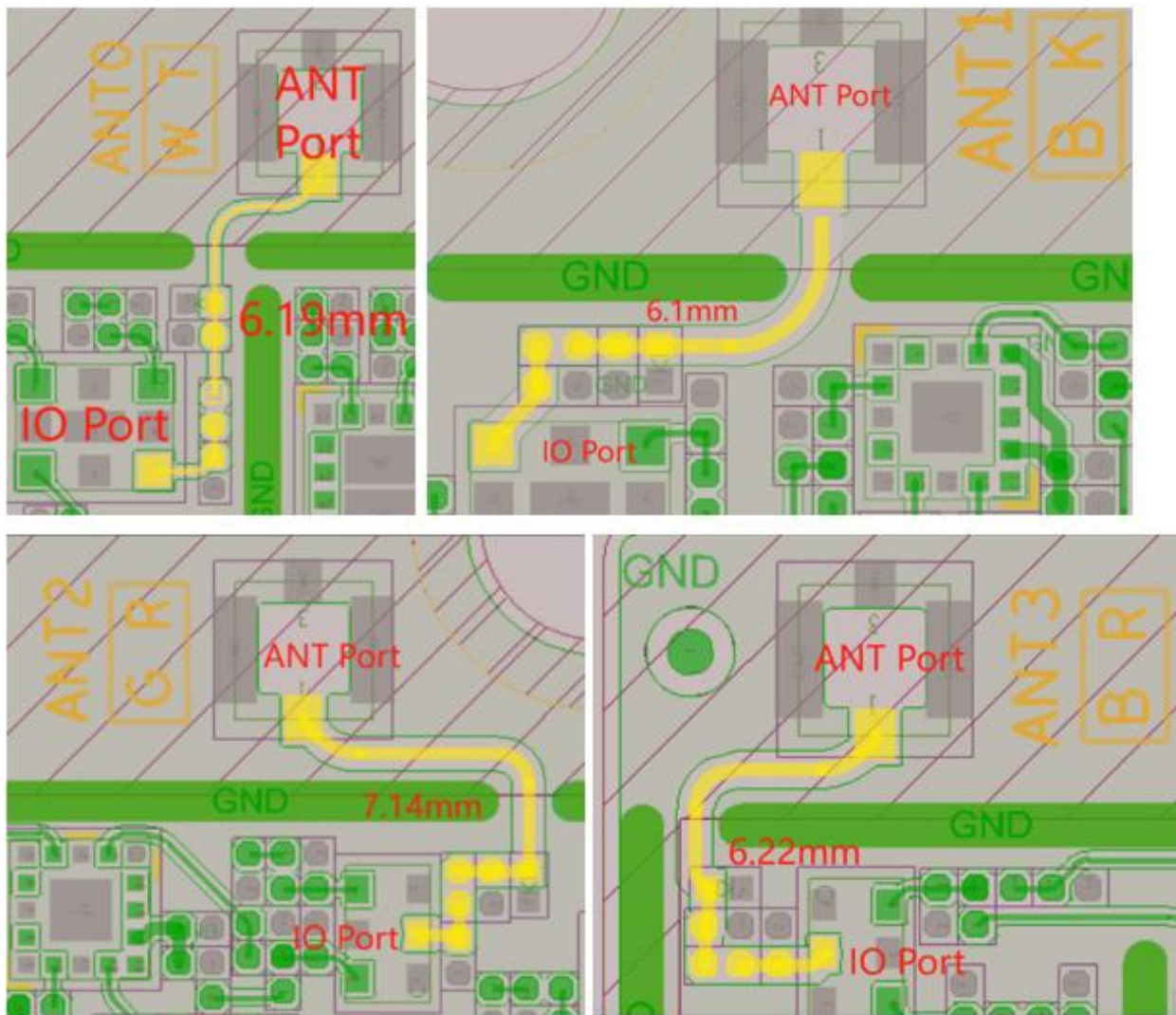
Figure 2-1 Antenna trace of module

2.3.5 Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

2.3.6 Federal Communication Commission Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital 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 the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

2.3.7 List of applicable FCC rules

This module has been tested and found to comply with part 22, part 24, part 27, part 90 and Part 96 requirements for Modular Approval.

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the

grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

2.3.8 This device is intended only for OEM integrators under the following conditions: (For module device use)

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2) The transmitter module may not be co-located with any other transmitter or antenna.
As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

2.3.9 Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

3 M.2 Connector

The NMQ2210 module connects to AP via M.2 connector. It is recommended to use M.2 connector from Foxconn Interconnect Technology with the model AS0BC21-S40BB-7H as shown in the following figure. For the package of connector, please refer to the specification.
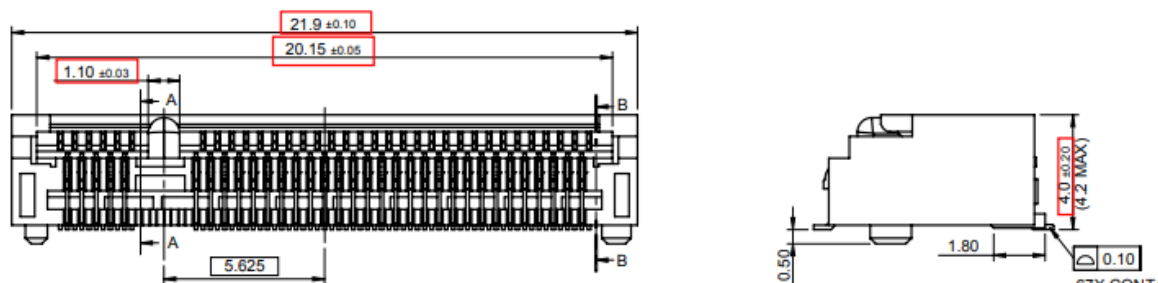

Figure 3-1 M.2 connector dimensions

3.1.1 Pin Map

Pin	Pin Name
74	VPH_PWR
72	VPH_PWR
70	VPH_PWR
68	FORCED_USB_BOOT
66	SDX_UIM1_PRESENT
64	LTE_COEX_UART_TX
62	LTE_COEX_UART_RX
60	NC
58	SDX_RFFE0_DATA
56	SDX_RFFE0_DATA
54	PCIE_WAKE_N
52	PCIE_CLKREQ_N
50	PCIE_RESET_N
48	UIM2_PWR
46	SDX_UIM2_RESET_N
44	SDX_UIM2_CLK
42	SDX_UIM2_DATA
40	SDX_UIM2_PRESENT
38	PCIE_USB_EDL_CTL
36	UIM1_PWR
34	SDX_UIM1_DATA
32	SDX_UIM1_CLK
30	SDX_UIM1_RESET_N
28	AP2SDX_GP_RESET
26	W_DISABLE2#
24	SSR_SDX2AP_STATUS
22	SSR_AP2SDX_STATUS
20	SSR_SDX2AP_E911_STATUS
18	CARD KEY B
16	

14	
12	CARD KEY B
10	LED1#
8	W_DISABLE1#
6	PHONE_ON_N
4	VPH_PWR
2	VPH_PWR
75	SDX_GPIO_11
73	SDX_GPIO_10
71	GND
69	GND
67	PMX_RESIN_N
65	SDX_GRFC_4_ANTCTL_4
63	SDX_RFFE1_CLK_ANTCTL_2
61	SDX_RFFE1_DATA_ANTCTL_1
59	SDX_GPIO_96
57	GND
55	PCIE_REFCLK_P
53	PCIE_REFCLK_M
51	GND
49	PCIE_RX_P
47	PCIE_RX_M
45	GND
43	PCIE_TX_P
41	PCIE_TX_M
39	GND
37	USB_SS_RX_P
35	USB_SS_RX_M
33	GND
31	USB_SS_TX_P
29	USB_SS_TX_M
27	GND
25	BODY_SAR
23	WAKEUP_HOST
21	PMX_GPIO_03
19	
17	CARD KEY B
15	
13	
11	GND
9	USB_HS_DM
7	USB_HS_DP
5	GND
3	GND
1	PMX_BOARD_ID

3.1.2 Pin Definition

Pin	Pin Name	I/O	Reset Value	Function
1	PMX_BOARD_ID	I	-	Test mode
2	VPH_PWR	PI	-	M.2 Module power supply
3	GND	-	-	GND
4	VPH_PWR	PI	-	M.2 Module power supply
5	GND	-	-	GND
6	PHONE_ON_N	I	PU	Module power-on/off control, the module is powered off when the pin is at low level, and the module is powered on when the pin is floating or at high level.
7	USB_HS_DP	I/O	-	USB 2.0 DATA+
8	W_DISABLE1#	I	PU	Disable flight mode of WWAN module, active low
9	USB_HS_DM	I/O	-	USB 2.0 DATA-
10	LED1#	O	T	System status LED driving pin, OD-gate output.
11	GND	-	-	GND
12	CARD KEY B	-	-	KEY B
13	CARD KEY B	-	-	KEY B
14	CARD KEY B	-	-	KEY B
15	CARD KEY B	-	-	KEY B
16	CARD KEY B	-	-	KEY B
17	CARD KEY B	-	-	KEY B
18	CARD KEY B	-	-	KEY B
19	CARD KEY B	-	-	KEY B
20	SSR_SDX2AP_E911_STATUS	O	PD	The GPIO configuration between the IPQ95XX and the SDX65 module
21	NC	-	-	Not connect

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22	SSR_AP2SDX_STATUS	I	PD	The GPIO configuration between the IPQ95XX and the SDX65 module
23	WAKEUP_HOST	O	PD	Wake up host
24	SSR_SDX2AP_STATUS	O	PD	The GPIO configuration between the IPQ95XX and the SDX65 module
25	BODY_SAR	I	PU	Dynamic power control for SAR interrupt detection, active low
26	W_DISABLE2#	I	PU	Disable GNSS, active low
27	GND	-	-	GND
28	AP2SDX_GP_RESET	I	T	The GPIO configuration between the IPQ95XX and the SDX65 module
29	USB_SS_TX_M	O	-	USB 3.0 TX-
30	SDX_UIM1_RESET_N	O	L	UIM1 Reset
31	USB_SS_TX_P	O	-	USB 3.0 TX+
32	SDX_UIM1_CLK	O	L	UIM1 Clk
33	GND	-	-	GND
34	SDX_UIM1_DATA	I/O	L	UIM1 Data
35	USB_SS_RX_M	I	-	USB3.1_RX-
36	VREG_L11E_UIM1_1P8	PO	-	UIM1 Power
37	USB_SS_RX_P	I	-	USB3.1_RX+
38	NC	-	-	Not connect
39	GND	-	-	GND
40	SDX_UIM2_PRESENT	I	-	UIM2 detect, need to pull up through 100k resistor external
41	PCIE_TX_M	O	-	PCIe TX-
42	SDX_UIM2_DATA	I/O	L	UIM2 Data
43	PCIE_TX_P	O	-	PCIe TX+
44	SDX_UIM2_CLK	O	L	UIM2 Clk
45	GND	-	-	GND

46	SDX_UIM2_RESET_N	O	L	UIM2 Reset
47	PCIE_RX_M	I	-	PCIe RX-
48	VREG_L13_1P8	PO	-	UIM2 Power
49	PCIE_RX_P	I	-	PCIe RX+
50	PCIE_RESET_N	I	PD	PCIe Control
51	GND	-	-	GND
52	PCIE_CLKREQ_N	I/O	T	PCIe Control
53	PCIE_REFCLK_M	I	-	PCIe CLK-
54	PCIE_WAKE_N	O	T	PCIe Control
55	PCIE_REFCLK_P	I	-	PCIe CLK+
56	SDX_RFFE0_DATA	O	PD	RFFE-MIPI serial clock signal
57	GND	-	-	GND
58	SDX_RFFE0_DATA	I/O	PD	RFFE-MIPI serial data signal
59	SDX_GPIO_96	O	PD	A high level is output to disable 5GHz WLAN LNAs when N79 transmitting power exceeds TBD dBm
60	NC	-	-	Not connect
61	SDX_RFFE1_DATA_ANTCTL_1	O	PD	Tunable antenna control bit 1
62	LTE_COEX_UART_RX	I	PD	LTE UART RX
63	SDX_RFFE1_CLK_ANTCTL_2	O	PD	Tunable antenna control bit 2
64	LTE_COEX_UART_TX	O	PD	LTE UART TX
65	SDX_GRFC_4_ANTCTL_4	O	PD	Tunable antenna control bit 4
66	SDX_UIM1_PRESENT	I	-	UIM1 detect, need to pull up through 100k resistor external
67	PMX_RESIN_N	I	PU	Reset Module
68	FORCED_USB_BOOT	I	-	After the pin is pulled up to 1.8V during power-on, the module will enter the USB download mode. The pin is used for updating the software of module.

				If it is floating or pulled to low level, the module will enter the normal mode.
69	GND	-	-	GPIO/MIPI RFFE_CLK
70	VPH_PWR	PI	-	M.2 Module power supply
71	GND	-	-	GND
72	VPH_PWR	PI	-	M.2 Module power supply
73	NC	-	-	Not connect
74	VPH_PWR	PI	-	M.2 Module power supply
75	NC	-	-	Not connect

Reset Value: The initial status after module reset, not the status when working.

H: High Level

L: Low Level

PD: Pull-Down

PU: Pull-Up

T: Tri-state, high impedance

OD: Open Drain

Pl: Power input

PO: Power Output
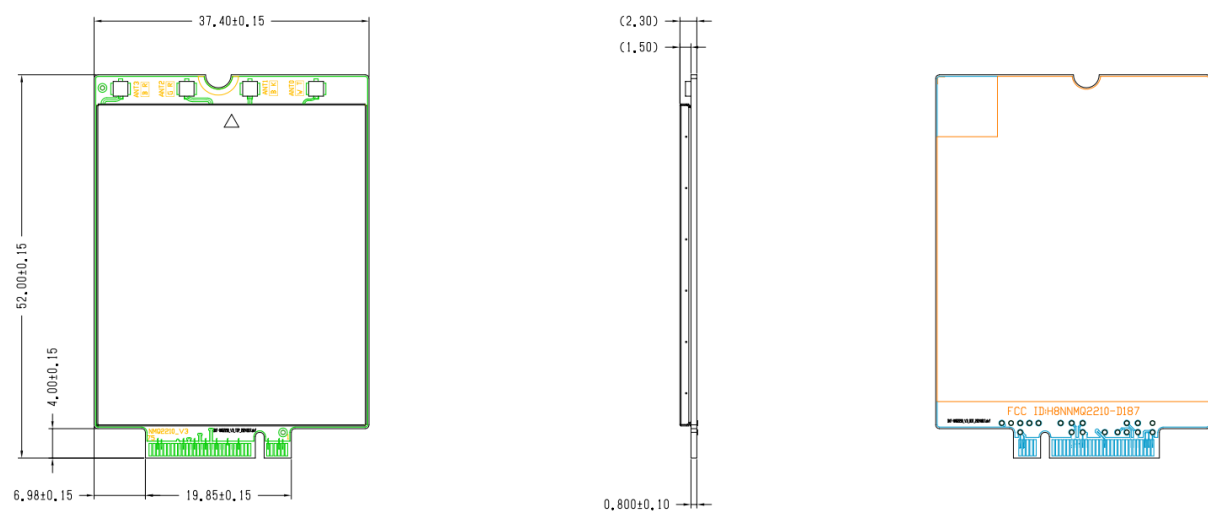
4 Structural Specification

4.1 Product Appearance

The appearance of the NMQ2210 module product is as shown:

Figure 4-1 Module product appearance

4.2 Dimension of Structure

The structural dimensions of the NMQ2210 module are shown in the figure.

Note:

Unmarked dimensional tolerances are 0.1mm.

4.3 Storage

Storage Conditions (recommended): Temperature is 23+5°C, relative humidity less than RH 60%.

Storage period: Under the recommended storage conditions, the storage life is 12 months.

4.4 Packing

The NMQ2210 module uses the tray sealed package, combined with the outer packing method using the hard cartoon box, the modules can be protected to the greatest extent during storage transportation and use.

Note:

The module is a precision electronic product, and may suffer permanent damage if no correct electrostatic protection measures are taken.