



WMX8202

**Wi-Fi 7 802.11be 2x2 Tri-band
M.2 2230 Module**

Product Datasheet

Version: 0.1.2

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1 Overview

The WMX8202 module is a highly integrated wireless local area network (WLAN) supporting Wi-Fi 7 and Bluetooth (BT) 5.4. The WMX8202 supports simultaneous operation (DBS / HBS) on 2.4 GHz + 5 GHz, 2.4 GHz + 6 GHz or 5/6 GHz + 5/6 GHz.

2 Feature

2.1 WLAN

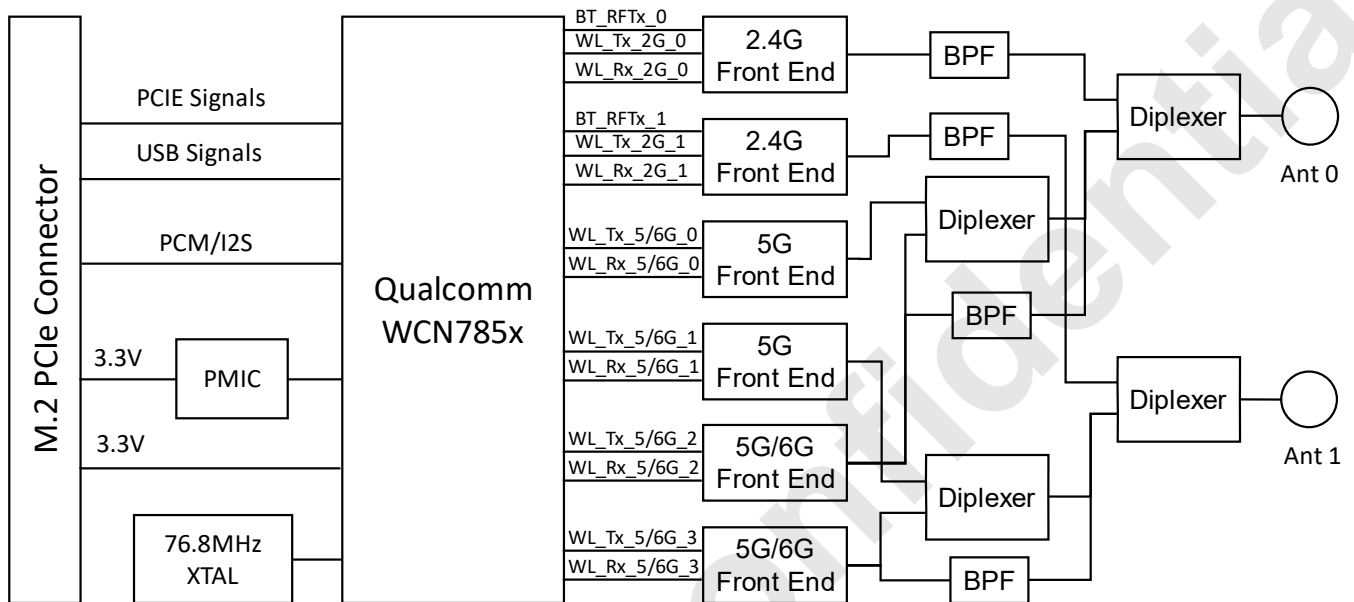
- Compliant with IEEE 802.11a/b/g/n/ac/ax/be
- Support Multi-link Operation (MLO)
- Support 2x2 Multi-User Multiple-Input Multiple-Output (MU-MIMO)
- Support tri-band 2.4 GHz/5 GHz/6 GHz
- Support up to 4096 QAM modulation at each band
- Channel bandwidth up to 40 MHz at 2.4 GHz, up to 160 MHz at 5 GHz and up to 320 MHz at 6 GHz
- Dual Band Simultaneous (DBS) up to 2.4 GHz 2x2 40 MHz + 5 GHz 2x2 160 MHz / 6 GHz 2x2 160 MHz
- High Band Simultaneous (HBS) up to 5 GHz/6 GHz 2x2 160 MHz + 5 GHz/6 GHz 2x2 160 MHz
- Up to 5.8 Gbps data rate (2x2 5 GHz 160 MHz + 2x2 6 GHz 160 MHz with 4K QAM modulation)
- Dynamic Frequency Selection (DFS) radar detection

2.2 Bluetooth

- Compliant with Bluetooth 5.4 and ANT+
- Support dual Bluetooth
- Support LE audio
- Support 2 Mbps Bluetooth Low Energy (BLE), BLE Long Range
- Split ACL support for A2DP true stereo (earbuds)
- Shared Bluetooth antenna with 2.4 GHz WLAN, and concurrent operation with 5 GHz/6 GHz WLAN
- Supports class 1 and class 2 power-level transmissions without requiring an external PA (power amplifier)
- Backward compatible with previous Bluetooth standards
- Flexible interface SLIMbus/PCM/I2S for Bluetooth audio

3 System Specification

3.1 Block Diagram



3.2 Chip Solution

- Qualcomm WCN7851-5

3.3 Protocol & Interface

- PCIe Gen3 2-lane interface for WLAN
- USB 1.1 interface for Bluetooth
- Antenna Port: MHF4(Compatible) connector x2 for 2T2R

3.4 Temperature

- Operating Temperature: -40°C to +85°C
- Storage Temperature: -40°C to +105°C

3.5 Humidity

- Operating Humidity (non-condensing): 5% ~ 95%
- Storage Humidity (non-condensing): 5% ~ 90%

4 WLAN Specification

4.1 WLAN Standard

- IEEE 802.11a/b/g/n/ac/ax/be
- IEEE 802.11d/e/h/i

4.2 Frequency Range

- Support 2.4GHz frequency range: 2412MHz ~ 2484MHz
- Support 5GHz frequency range: 5150MHz - 5850MHz
- Support 6GHz frequency range: 5925MHz - 7125MHz

4.3 Band Width

- 20 MHz/40 MHz channel bandwidth for 2.4 GHz
- 20 MHz/40 MHz/80 MHz/160 MHz channel bandwidth for 5 GHz/6 GHz
- 320MHz channel bandwidth for 6 GHz

4.4 Data Rate

- 2.4GHz
802.11n HT40 2SS: 300Mbps
802.11ax HE40 2SS: 573Mbps
802.11be EHT40 2SS: 573Mbps
- 5GHz/6GHz
802.11n HT40 2SS: 300Mbps
802.11ac VHT160 2SS: 1733Mbps
802.11ax HE160 2SS: 2402Mbps
802.11be EHT320 2SS: 5764Mbps

4.5 Modulation

- 802.11n:
OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
- 802.11ac:
OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM)
- 802.11ax:
OFDMA (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM)
- 802.11be:
OFDMA (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM, 4096QAM)

4.6 Output Power & Sensitivity

2.4GHz

2.4GHz 802.11b		
Data Rate	Tx \pm 2dB	Rx Sensitivity \pm 2dB
1M	19.0dBm	-89.0dBm
11M	19.0dBm	-75.5dBm

2.4GHz 802.11g		
Data Rate	Tx \pm 2dB	Rx Sensitivity \pm 2dB
6M	18.0dBm	-89.0dBm
54M	16.5dBm	-75.5dBm

2.4GHz 802.11n				
Data Rate	Tx \pm 2dB	Tx \pm 2dB(2TX)	Rx Sensitivity \pm 2dB	
HT20	MCS 0	18.0dBm	21.0dBm	-93.5dBm
	MCS 7	15.5dBm	18.5dBm	-75.5dBm
HT40	MCS 0	17.5dBm	20.5dBm	-90.5dBm
	MCS 7	15.0dBm	18.0dBm	-72.5dBm

2.4GHz 802.11ax/be				
Data Rate	Tx \pm 2dB	Tx \pm 2dB(2TX)	Rx Sensitivity \pm 2dB	
HE20/ EHT20	MCS 0	18.0dBm	21.0dBm	-92.5dBm
	MCS 7	16.5dBm	19.5dBm	-73.5dBm
	MCS 9	15.0dBm	18.0dBm	-67.5dBm
	MCS 11	14.5dBm	17.5dBm	-62.0dBm
	MCS 13	14.0dBm	17.0dBm	-57.0dBm
HE40/ EHT40	MCS 0	17.5dBm	20.5dBm	-89.5dBm
	MCS 7	16.0dBm	19.0dBm	-71.0dBm
	MCS 9	15.0dBm	18.0dBm	-65.5dBm
	MCS 11	14.0dBm	17.0dBm	-61.0dBm
	MCS 13	13.0dBm	16.0dBm	-54.0dBm

5GHz

2.4GHz 802.11a		
Data Rate	Tx ± 2dB	Rx Sensitivity ± 2dB
6M	17.0dBm	-90.0dBm
54M	16.0dBm	-72.5dBm

5GHz 802.11n				
Data Rate		Tx ± 2dB	Tx ± 2dB(2TX)	Rx Sensitivity ± 2dB
HT20	MCS 0	17.0dBm	20.0dBm	-91.5dBm
	MCS 7	15.0dBm	18.0dBm	-73.0dBm
HT40	MCS 0	17.0dBm	20.0dBm	-87.5dBm
	MCS 7	15.0dBm	18.0dBm	-69.5dBm

5GHz 802.11ac				
Data Rate		Tx ± 2dB	Tx ± 2dB(2TX)	Rx Sensitivity ± 2dB
VHT20	MCS 0	17.0dBm	20.0dBm	-92.5dBm
	MCS 7	15.0dBm	18.0 dBm	-74.0dBm
	MCS 9	13.5dBm	16.5dBm	-68.5dBm
VHT40	MCS 0	17.0dBm	20.0dBm	-88.0dBm
	MCS 7	15.0dBm	18.0dBm	-70.0dBm
	MCS 9	13.5dBm	16.5dBm	-64.0dBm
VHT80	MCS 0	17.0dBm	20.0dBm	-84.0dBm
	MCS 7	15.0dBm	18.0dBm	-66.5dBm
	MCS 9	13.5dBm	16.5dBm	-60.5dBm
VHT160	MCS 0	16.5dBm	19.5dBm	-81.0dBm
	MCS 7	14.5dBm	17.5dBm	-63.0dBm
	MCS 9	13.0dBm	16.0dBm	-58.5dBm

5GHz

5GHz 802.11ax/be				
Data Rate		Tx ± 2dB	Tx ± 2dB(2TX)	Rx Sensitivity ± 2dB
HE20/ EHT20	MCS 0	17.0dBm	20.0dBm	-89.5dBm
	MCS 7	15.0dBm	18.0dBm	-70.0dBm
	MCS 9	13.5dBm	16.5dBm	-64.0dBm
	MCS 11	13.0dBm	16.0dBm	-60.0dBm
	MCS 13	12.5dBm	15.5dBm	-54.0dBm

HE40/ EHT40	MCS 0	17.0dBm	20.0dBm	-87.0dBm
	MCS 7	15.0dBm	18.0dBm	-68.5dBm
	MCS 9	13.5dBm	16.5dBm	-62.5dBm
	MCS 11	13.0dBm	16.0dBm	-57.5dBm
	MCS 13	12.5dBm	15.5dBm	-51.5dBm
HE80/ EHT80	MCS 0	17.0dBm	20.0dBm	-84.0dBm
	MCS 7	15.0dBm	18.0dBm	-65.0dBm
	MCS 9	13.5dBm	16.5dBm	-59.5dBm
	MCS 11	13.0dBm	16.0dBm	-54.5dBm
	MCS 13	12.5dBm	15.5dBm	-48.5dBm
HE160/ EHT160	MCS 0	17.0dBm	20.0dBm	-81.0dBm
	MCS 7	15.0dBm	18.0dBm	-62.5dBm
	MCS 9	13.5dBm	16.5dBm	-56.5dBm
	MCS 11	13.0dBm	16.0dBm	-51.5dBm
	MCS 13	12.5dBm	15.5dBm	-45.5dBm

6GHz

5GHz/6GHz 802.11ax				
Data Rate		Tx \pm 2dB	Tx \pm 2dB(2TX)	Rx Sensitivity \pm 2dB
HE20/ ETH20	MCS 0	16.0dBm	19.0dBm	-88.5dBm
	MCS 7	14.0dBm	17.5dBm	-69.0dBm
	MCS 9	13.0dBm	16.0dBm	-63.0dBm
	MCS 11	12.0dBm	15.0dBm	-59.0dBm
	MCS 13	11.5dBm	14.5dBm	-53.0dBm
HE40/ EHT40	MCS 0	16.0dBm	19.0dBm	-85.5dBm
	MCS 7	14.0dBm	17.0dBm	-67.0dBm
	MCS 9	13.0dBm	16.0dBm	-61.0dBm
	MCS 11	12.0dBm	15.0dBm	-56.5dBm
	MCS 13	11.5dBm	14.5dBm	-50.5dBm
HE80/ EHT80	MCS 0	16.0dBm	19.0dBm	-82.5dBm
	MCS 7	14.0dBm	17.0dBm	-63.5dBm
	MCS 9	13.0dBm	16.0dBm	-58.0dBm
	MCS 11	12.0dBm	15.0dBm	-53.5dBm
	MCS 13	11.5dBm	14.5dBm	-47.5dBm

HE160/ EHT160	MCS 0	16.0dBm	19.0dBm	-80.5dBm
	MCS 7	14.0dBm	17.0dBm	-62.0dBm
	MCS 9	13.0dBm	16.0dBm	-56.0dBm
	MCS 11	12.0dBm	15.5dBm	-50.5dBm
	MCS 13	11.5dBm	14.5dBm	-45.0dBm
HE320/ EHT320	MCS 0	16.0dBm	19.0dBm	-80.0dBm
	MCS 7	14.0dBm	17.0dBm	-59.0dBm
	MCS 9	13.0dBm	16.0dBm	-53.0dBm
	MCS 11	11.0dBm	14.0dBm	-48.5dBm
	MCS 13	10.5dBm	13.5dBm	-42.0dBm

5 Bluetooth Specification

5.1 WLAN Standard

- BT v2.1+EDR3.0+BLE4.0/4.1/4.2/5.0/5.2/5.3/5.4

5.2 Frequency Range

- Support 2.4GHz frequency range: 2402MHz ~ 2480MHz

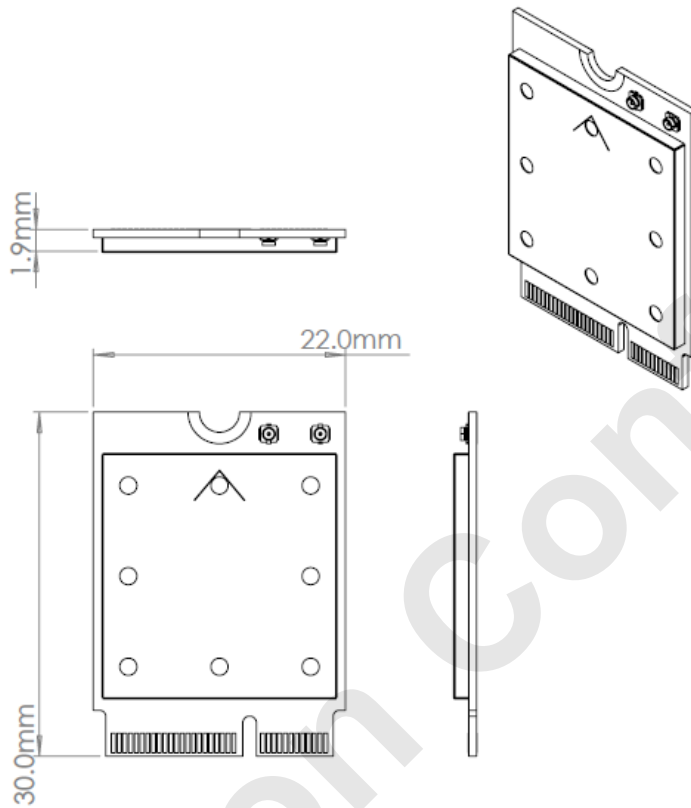
5.3 Modulation

- BT: 8DPSK, $\pi/4$ -DQPSK, GFSK

6 Mechanical Specification

6.1 Mechanical Outline Drawing

(Preliminary mechanical outline drawing)

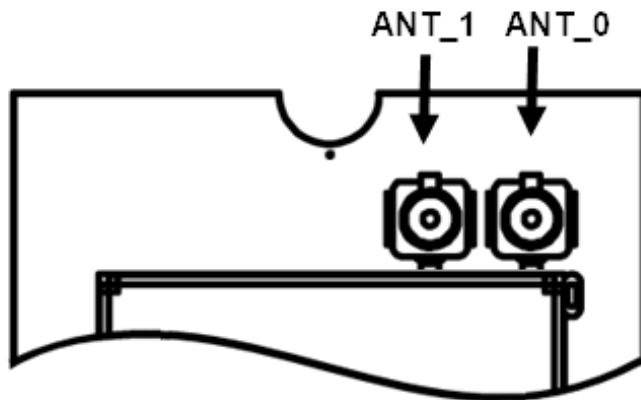


General tolerance: $\pm 0.2\text{mm}$

6.2 Interface & Dimension

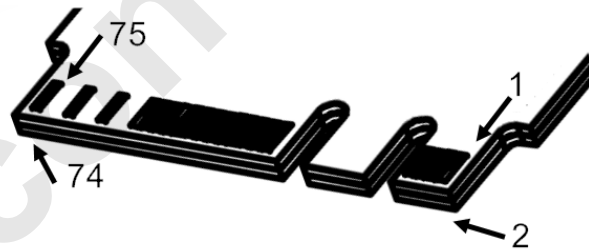
- Interface: M.2 2230 E Key
- Typical Dimension: (W)22.0mm x (L)30mm x (H)1.9mm

6.3 Antenna Connector



Pin Name	Description
Ant_0	RF Antenna for WiFi 2.4GHz/5GHz/6GHz and Bluetooth
Ant_1	RF Antenna for WiFi 2.4GHz/5GHz/6GHz

6.4 Pin Assignment



PIN	Pin Name	Design Status	PIN	Pin Name	Design Status
1	GND	GND			
3	USB_D+	BT_USB_DP	2	3.3V	3V3
5	USB_D-	BT_USB_DM	4	3.3V	3V3
7	GND	GND	6	LED_1#	NC
9	SDIO_CLK	NC	8	PCM_CLK/I2S SCK	BT_I2S_0_SCK
11	SDIO_CMD	NC	10	PCM_SYNC/I2S WS	BT_I2S_0_WS
13	SDIO_DATA0	NC	12	PCM_OUT/I2S SD_OUT	BT_I2S_0_SDO
15	SDIO_DATA1	NC	14	PCM_IN/I2S SD_IN	BT_I2S_0_SDI

17	SDIO_DATA2	NC	16	LED_2#	NC
19	SDIO_DATA3	NC	18	GND	GND
21	SDIO_WAKE#	NC	20	UART WAKE	NC
23	SDIO_RESET#	NC	22	UART TX	NC
25	Module Key E		24	Module Key E	
27	Module Key E		26	Module Key E	
29	Module Key E		28	Module Key E	
31	Module Key E		30	Module Key E	
33	GND	GND	32	UART RX	NC
35	PERp0	WL_PCIE_RXP0	34	UART RTS	NC
37	PERn0	WL_PCIE_RXN0	36	UART CTS	NC
39	GND	GND	38	VENDOR DEFINED	NC
41	PETp0	WL_PCIE_TXP0	40	VENDOR DEFINED	NC
43	PETn0	WL_PCIE_TXN0	42	VENDOR DEFINED	NC
45	GND	GND	44	COEX3	NC
47	REFCLKp0	WL_PCIE_REFCLKP	46	COEX2	NC
49	REFCLKn0	WL_PCIE_REFCLKN	48	COEX1	NC
51	GND	GND	50	SUSCLK(32kHz)	NC
53	CLKREQ0#	WL_PCIE_CLKREQ0	52	PERST0#	WL_PCIE_RST
55	PEWAKE0#	WL_PCIE_WAKE0	54	W_DISABLE2#	BT_EN
57	GND	GND	56	W_DISABLE1#	WL_RF_KILL
59	PERp1	WL_PCIE_RXP1	58	I2C DATA	NC
61	PERn1	WL_PCIE_RXN1	60	I2C CLK	NC
63	GND	GND	62	ALERT#	NC
65	PETp1	WL_PCIE_TXP1	64	RESERVED	NC
67	PETn1	WL_PCIE_TXN1	66	RESERVED	NC
69	GND	GND	68	RESERVED	NC
71	REFCLKp1	NC	70	RESERVED	NC
73	REFCLKn1	NC	72	3.3Vaux	3V3
75	GND	GND	74	3.3Vaux	3V3

6.5 Pin Define

Design Name	I/O	Voltage	Description
WL_PCIE_RST	I	0/3.3V	WLAN PCIe reset
WL_PCIE_WAKE0	O	0/3.3V	WLAN PCIe wake-up signal. It is an open-drain signal that requires an external pull-up resistor.
WL_PCIE_CLKREQ0	B	0/3.3V	WLAN PCIe clock request signal. It is an open-drain signal that requires an external pull-up resistor.
WL_PCIE_REFCLKP	I		WLAN PCIe reference clock input differential signals
WL_PCIE_REFCLKN	I		
WL_PCIE_RXP0	I		WLAN PCIe receive input differential signals lane 0
WL_PCIE_RXN0	I		
WL_PCIE_TXP0	O		WLAN PCIe transmit output differential signals lane 0
WL_PCIE_TXN0	O		
WL_PCIE_RXP1	I		WLAN PCIe receive input differential signals lane 1
WL_PCIE_RXN1	I		
WL_PCIE_TXP1	O		WLAN PCIe transmit output differential signals lane 1
WL_PCIE_TXN1	O		
WL_RF_KILL	I	0/3.3V	It is an interrupt pin to WLAN CPU. When WLAN detected interrupt, it turns off WLAN MAC/PHY/RF for power save application
BT_USB_DP	A		USB 1.1 interface to support full-speed only (no low-speed mode) and peripheral device mode only (no master mode). 1.5 K Ω pull up to D+ is integrated in the device. No external resistor is required. Ensure that host has 15 K Ω pull down resistor on both D+ and D- according to USB 1.1 specification.
BT_USB_DM	A		
BT_I2S_0_SCK	I	0/1.8V	Bluetooth 4-wire I2S interface operated in slave mode. The clock rate is up to 2.048 MHz. If SLIMbus mode is configured, it is used with Qualcomm mobile host platform only, it operates as slave mode up to 24.x MHz. In PCM mode, it operates at 16-bit mono with either 8 KHz or 16 KHz. In Split mode of packet data, supports A2DP, dual eSCO, dual A2DP, up to APTx HD and LDAC. Codecs offloaded to LPASS.
BT_I2S_0_WS	I	0/1.8V	
BT_I2S_0_SDO	O	0/1.8V	
BT_I2S_0_SDI	I	0/1.8V	
BT_EN	I	0/3.3V	Bluetooth enable signal. It is an input, active high to enable Bluetooth operation.

7 Product Appearance

7.1 Product Picture



8 Electrical characteristics

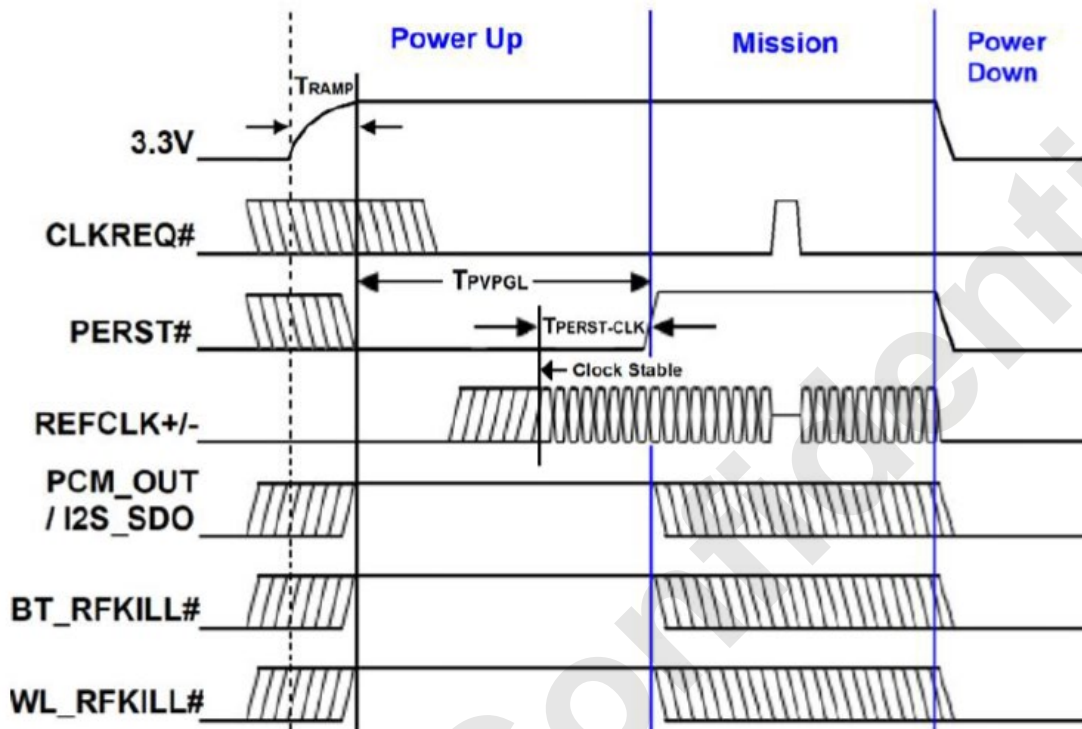
8.1 Power Consumption

- Max power consumption(25°C):
Single Band: 3.2W
Dual Band: 4.1W (DBDC 2.4GHz + 5GHz)
Dual Band: 5.2W (DBDC 5GHz + 6GHz)

8.2 Operating Voltage

- M.2 Interface DC 3.3V $\pm 5\%$

8.3 Power up Sequence



Timing requirement as below

Symbol	I/O	Min	Max	Units
T_{RAMP}	Power Supply Ramp on 3.3V	-	100	ms
T_{PVPGL}	Power (3.3V) valid to PERST# input de-asserted	50	-	ms
$T_{PESRT-CLK}$	REFCLE stable before PERST# de-asserted	100	-	us

9 Software & Driver

9.1 Driver Support

- Windows:
Windows 10 / Windows 11 (32bit/64bit)
- Linux:
QCA Standard LEA Linux Driver support kernel 5.4.0+, 5.10.0+, 5.15.24+
Open Driver: ATH12K

9.2 Platform Support List

- Intel x86(Verified)
- ARM/MIPS

9.3 RF Tool

- RF test tool consultant service available

10 Certification

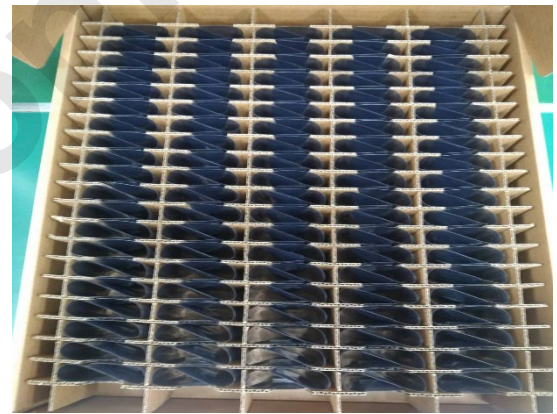
CE/FCC/IC (TBD)

11 Package

- One module per one static bag



- Two static bags in one lattice and 200pcs per inner box



- 5 inner boxes per 1 carton and 1000pcs per carton



12 Ordering Information

12.1 Main Parts

Part Number	Description
WMX8202	Wi-Fi 7 802.11be 2x2 Tri-band M.2 2230 Module

12.2 Accessories

Part Number	Description
ATD7251	Monopole 2dBi Antenna for 2.4GHz/5GHz/6GHz
AC42001	Cable MHF4 to SMA, 200mm