

AW-XM458MA

**IEEE 802.11 2X2 WiFi 6 SU and MU-MIMO DBC
Wireless LAN + Bluetooth 5
Combo M.2 2230 Module**

Datasheet

Rev. A

DF

For Standard

Features

WLAN

- ◆ Support 2x2 802.11 a/b/g/n/ac/ax
- ◆ Dual bands: 2.4 GHz and 5 GHz
- ◆ Support 20/40/80/(80+80) MHz channel Bandwidths.
- ◆ 5GHz PHY data rates up to 1.2 Gbps
- ◆ 2.4 GHz PHY data rates up to 458 Mbps
- ◆ Uplink and downlink OFDMA and MU-MIMO
- ◆ Instantaneous 0-DFS

WLAN Dual-Radios

- ◆ Dual, independent direct-conversion WLAN radios (with dual-MACs and dual-Basebands) supports true, simultaneous WLAN network operation at 2 different frequency bands,

Bluetooth

- ◆ Bluetooth 5
- ◆ Bluetooth class 2
- ◆ Bluetooth class 1
- ◆ PCM interface for voice applications
- ◆ 2Mbit/s LE
- ◆ Long range
- ◆ LTE/MWS coexistence
- ◆ 2 x wide band speech (WBS) calls
- ◆ Security: AES

Revision History

Document NO: R2-2458MA-DST-01

Version	Revision Date	DCN NO.	Description	Initials	Approved
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1. Introduction

1.1 Product Overview

AzureWave Technologies, Inc. introduces the IEEE 802.11a/b/g/n/ac/ax Concurrent Dual WiFi(CDW) and BT, combo module – **AW-XM458MA**. With High Efficiency Wireless(HEW) and backward compatible with 802.11ac technologies integrated into a module, AW-XM458MA provides the best and most convenient SMT process. The module is targeted to mobile devices including, Tablet PC, Portable Media Players (PMPs), Portable Navigation Devices (PNDs), Personal Digital Assistants (PDAs), Tracking Devices, Gaming Devices which need convenient SMT process, low power consumption.

By using AW-XM458MA, the customers can easily integrate the Wi-Fi, BT, by a combo module with the benefits of **high design flexibility, high success rate on SMT process, short development cycle, and quick time-to-market**.

Compliance with the IEEE 802.11a/b/g/n/ac/ax standard, the AW-XM458MA uses **DSSS, OFDM, DBPSK, DQPSK, CCK and QAM** baseband modulation technologies. A high level of integration and full implementation of the power management functions specified in the IEEE 802.11 standard minimize the system power requirements by using AW-XM458MA.

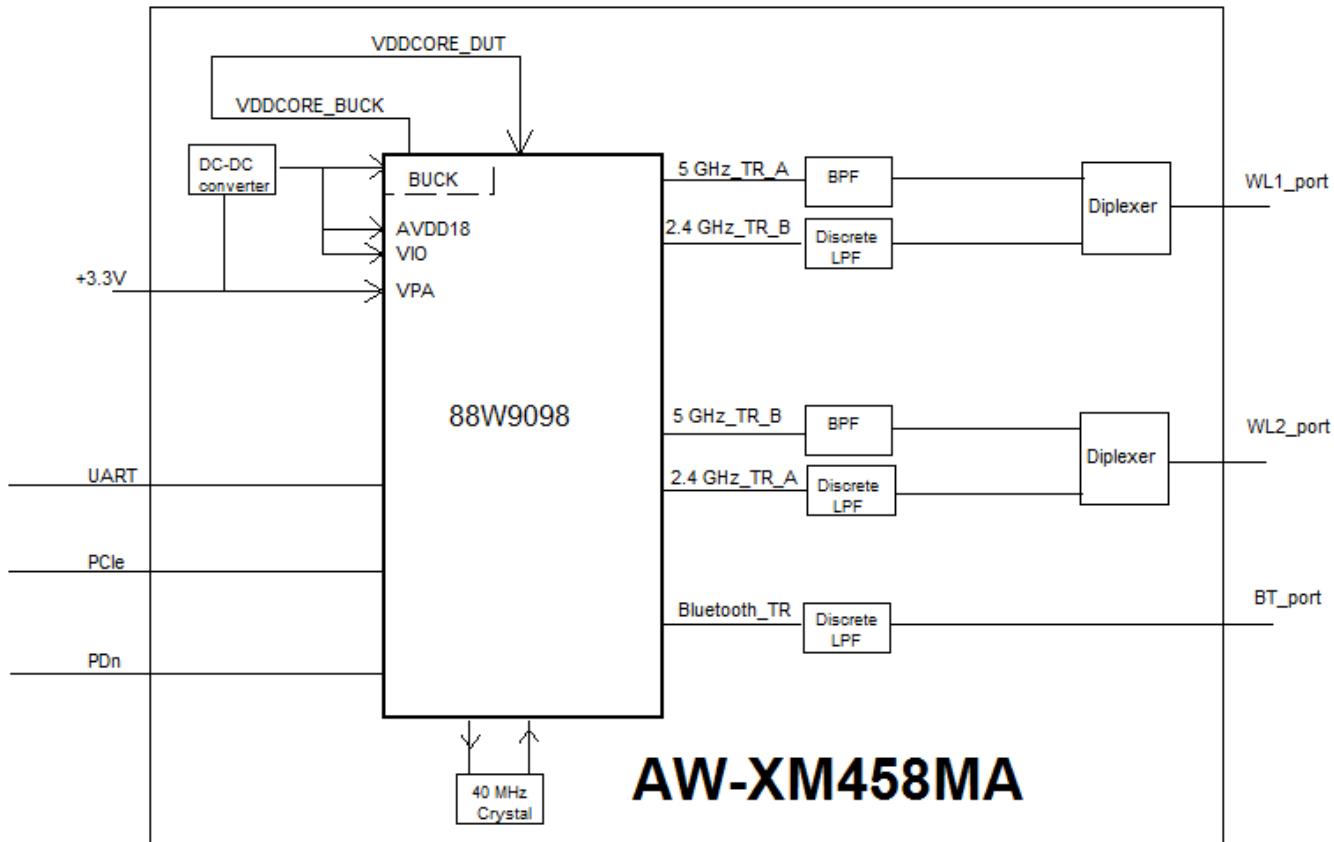
The AW-XM458MA supports standard interface **PCIe for WLAN** interface connection. High-Speed **UART for BT** interface connection. AW-XM458MA is suitable for multiple mobile processors for different applications. With the combo functions and the good performance, the AW-XM458MA is the best solution for the consumer electronics and the tablet PC.

Scenario	2.4GHz Band			5GHz Band		
	Mode	Technology	BW	Mode	Technology	BW
1	2x2	802.11n	40MHz	2x2	802.11ax	80MHz
2	2x2	802.11n	40MHz	1x1	802.11ax	80+80MHz
3	2x2	802.11ax	40MHz	2x2	802.11ac	40MHz
4	2x2	802.11n	40MHz	1x1	802.11ax	80MHz

Concurrent 2.4GHz and 5GHz modes supported table

1.2 Block Diagram

A simplified block diagram of the AW-XM458MA module is depicted in the figure below.



1.3 Specifications Table

1.3.1 General

Features	Description
Product Description	IEEE 802.11 a/b/g/n/ac/ax Wi-Fi with Bluetooth 5 Combo Module
Major Chipset	NXP 88W9098
Host Interface	Wi-Fi: PCIe3.0 BT: UART
Dimension	28 mm X 30 mm x 3.65 mm(Max)
Package	Alternative sized M.2 2230 Key E
Weight	TBD

1.3.2 WLAN

Features	Description
WLAN Standard	IEEE802.11 a/b/g/n/ac/ax
Frequency Range	2.4 GHz ISM Bands 2.412-2.472 GHz 5.15-5.25 GHz (FCC UNII-low band) for US/Canada and Europe 5.25-5.35 GHz (FCC UNII-middle band) for US/Canada and Europe 5.47-5.725 GHz for Europe 5.725-5.825 GHz (FCC UNII-high band) for US/Canada
Modulation	DSSS, OFDM, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM
Number of Channels	2.4GHz: <ul style="list-style-type: none"> ■ USA, NORTH AMERICA, Canada and Taiwan - 1 ~ 11 ■ China, Australia, Most European Countries - 1 ~ 13 ■ Japan, 1 ~ 13 5GHz: <ul style="list-style-type: none"> ■ USA, Canada, Most European Countries -36,40,44,48,52,56,60,64,100,104,108,112,116,120,124,128,132,136,140,149,153,157,161,165 ■ Japan - 36,40,44,48,52,56,60,64,100,104,108,112,116,120,124,128,132,136,140 ■ China - 36,40,44,48,52,56,60,64, 149,153,157,161,165

Output Power
(Board Level Limit)*

2.4G

	Min	Typ	Max	Unit
11b (11Mbps) @EVM<35%		18		dBm
11g (54Mbps) @EVM≤-27 dB		17		dBm
11n (HT20 MCS7) @EVM≤-28 dB		16		dBm
11n (HT40 MCS7) @EVM≤-28 dB		16		dBm
11n (HE20 MCS11) @EVM≤-35 dB		TBD		dBm
11n (HE40 MCS11) @EVM≤-35 dB		TBD		dBm

5G

	Min	Typ	Max	Unit
11a (54Mbps) @EVM≤-27 dB		16		dBm
11n (HT20 MCS7) @EVM≤-28 dB		16		dBm
11n (HT40 MCS7) @EVM≤-28 dB		15		dBm
11ac(VHT20 MCS8) @EVM≤-31 dB		15		dBm
11ac(VHT40 MCS9) @EVM≤-32 dB		15		dBm
11ac(VHT80 MCS9) @EVM≤-32 dB		15		dBm
11ax(HE20 MCS11) @EVM≤-35 dB		TBD		dBm
11ax(HE40 MCS11) @EVM≤-35 dB		TBD		dBm
11ax(HE80 MCS11) @EVM≤-35 dB		TBD		dBm

Receiver Sensitivity	2.4G			
	11b (11Mbps)	-	-88	dBm
	11g (54Mbps)	-	-75	dBm
	11n (HT20 MCS7)	-	-72	dBm
	11n (HT40 MCS7)	-	-69	dBm
	11ax(HE20 MCS11)		TBD	dBm
	11ax(HE40 MCS11)		TBD	dBm
	5G			
	11a (54Mbps)	-	-72	dBm
	11n (HT20 MCS7)	-	-70	dBm
	11n (HT40 MCS7)	-	-68	dBm
	11ac(VHT20 MCS8)	-	-65	dBm
	11ac(VHT40 MCS9)		-63	dBm
	11ac(VHT80 MCS9)		-60	dBm
	11ax(HE20 MCS11)		TBD	dBm
	11ax(HE40 MCS11)		TBD	dBm
	11ax(HE80 MCS11)		TBD	dBm
Data Rate	<ul style="list-style-type: none"> ■ 802.11b: 1, 2, 5.5, 11Mbps ■ 802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54Mbps ■ 802.11n: up to 150Mbps-single ■ 802.11n: up to 300Mbps-2x2 MIMO ■ 802.11ac:up to 192.6Mbps (20MHz channel) ■ 802.11ac:up to 400Mbps (40MHz channel) ■ 802.11ac:up to 866.7Mbps (80MHz channel) ■ 802.11ax:2.4GHz up to 458Mbps, 5GHz up to 1.2Gbps 			
Security	<ul style="list-style-type: none"> ■ WiFi: WPA/WPA2/WPA3 			

* If you have any certification questions about output power please contact FAE directly.

1.3.3 Bluetooth

Features	Description
Bluetooth Standard	Full Bluetooth 5 features
Frequency Range	2402MHz~2483MHz

Modulation	Header GFSK Payload 2M: π/4-DQPSK Payload 3M: 8DPSK				
Output Power	BDR	Min	Typ	Max	Unit
	EDR		TBD		dBm
	Low Energy		TBD		dBm
Receiver Sensitivity	BT Sensitivity (BER<0.1%)				
	BDR(DH1)	-	TBD		dBm
	EDR(2DH5)	-	TBD		dBm
	EDR(3DH5)	-	TBD		dBm
	Low Energy	-	TBD		dBm

1.3.4 Operating Conditions

Features	Description
Operating Conditions	
Voltage	3.3V +-5%
Operating Temperature	-30 ~ +85 °C
Operating Humidity	less than 85% RH
Storage Temperature	-40 ~ +85 °C
Storage Humidity	less than 60% RH

2.1 Pin Table

Pin No.	Definition	Basic Description	Voltage	Type
1	GND	Ground.		GND
2	VDD33	3.3V power supply	3.3V	VCC
3	USB_D_P	USB Differential signal	3.3V	I/O
4	VDD33	3.3V power supply	3.3V	VCC
5	USB_D_N	USB Differential signal	3.3V	I/O
6	NC	NC		Floating
7	GND	Ground.		GND
8	NC	NC		Floating
9	NC	NC		Floating
10	NC	NC		Floating
11	NC	NC		Floating
12	NC	NC		Floating
13	NC	NC		Floating
14	NC	NC		Floating
15	NC	NC		Floating
16	NC	NC		Floating
17	NC	NC		Floating
18	GND	Ground.		GND
19	NC	NC		Floating
20	NC	NC		Floating
21	NC	NC		Floating

22	UART_RX	UART SIN pin	1.8V	Input
23	NC	NC		Floating
32	UART_TX	UART SOUT.pin	1.8V	Output
33	GND	Ground.		GND
34	UART_RTSpn	UART Mode: UART_RTSpn (active low)	1.8V	Output
35	PERp0	Differential receive.	1.8V	Input
36	UART_CTSn	UART Mode: UART_CTSn (active low)	1.8V	Input
37	PERn0	Differential receive.	1.8V	Input
38	NC	NC		Floating
39	GND	Ground.		GND
40	NC	NC		Floating
41	PETp0	Differential transmit.	1.8V	Output
43	PETn0	Differential transmit.	1.8V	Output
44	NC	NC		Floating
45	GND	Ground.		GND
46	NC	NC		Floating
47	REFCLKP	Differential reference clock.	1.8V	Input
48	NC	NC		Floating
49	REFCLKN	Differential reference clock.	1.8V	Input
50	NC	NC		Floating
51	GND	Ground.		GND
52	PERST0	PCI Express Reset Signal: active low.	3.3V	Input
53	CLKREQ0	Reference clock request	3.3V	Output

54	NC	NC		Floating
55	PEWAKE#	Open Drain active Low signal. This signal is used to request that the system return from a sleep/suspended state to service a function initiated wake event.	3.3V	OUT
56	W_DISABLE1#	Pull power down for WLAN/BT	3.3V	IN
57	GND	Ground.		GND
58	NC	NC		Floating
59	NC	NC		Floating
60	NC	NC		Floating
61	NC	NC		Floating
62	NC	NC		Floating
63	GND	Ground.		GND
64	NC	NC		Floating
65	NC	NC		Floating
66	NC	NC		Floating
67	NC	NC		Floating
68	NC	NC		Floating
69	GND	Ground.		GND
70	NC	NC		Floating
71	NC	NC		Floating
72	VDD33	3.3V power supply	3.3V	VCC
73	NC	NC		Floating
74	VDD33	3.3V power supply	3.3V	VCC
75	GND	Ground.		GND
76	GND	Ground.		GND

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
3V3	DC supply for the 3.3V input	-	3.3	3.63	V

3.2 Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
3.3V	DC supply for the 3.3V input	3.14	3.3	3.46	V

3.3 Digital IO Pin DC Characteristics

3.3.1 1.8V Operation (VIO)

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V_{IH}	Input high voltage	0.7*VIO	-	$V_{IO}+0.4$	V
V_{IL}	Input low voltage	-0.4	-	0.3*VIO	
V_{OH}	Output high voltage	$V_{IO}-0.4$	-	-	
V_{OL}	Output low voltage	-	-	0.4	
V_{HYS}	Input Hysteresis	100			mV

3.3.2 3.3V Operation (VIO)

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V_{IH}	Input high voltage	0.7*VIO	-	VIO+0.4	V
V_{IL}	Input low voltage	-0.4	-	0.3*VIO	
V_{OH}	Output High Voltage	VIO-0.4	-	-	
V_{OL}	Output Low Voltage	-	-	0.4	
V_{HYS}	Input Hysteresis	100			mV

3.4 Host Interface

3.4.1 PCI Express Interface

3.4.1.1 Differential Tx Output Electricals

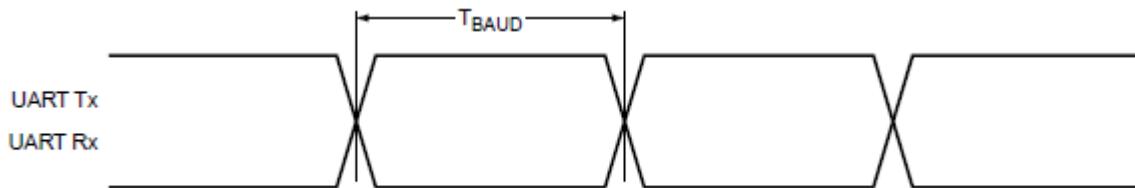
Symbol	Parameter	Min	Type	Max	Units
UI	Unit interval Each UI is 400 ps ±300 PPM. UI does not account for SSC dictated variations.	399.98	400	400.12	ps
V _{Tx_DIFFpp}	Differential peak-to-peak output voltage $V_{Tx_DIFFpp} = 2 * V_{Tx-D+} - V_{Tx-D-} $	0.800	--	1.2	V
V _{Tx_DE_RATIO}	De-emphasized differential output voltage (ratio)	-3.0	-3.5	-4.0	db
T _{Rx_EYE}	Minimum Tx eye width	0.75	--	--	UI
T _{Rx_EYE_MEDIAN_MAX_JIT}	Maximum time between jitter median and maximum deviation from median	--	--	0.125	UI
T _{Tx_RISE, Tx_FALL}	D+/D- Tx output rise/fall time	0.125	--	--	UI
V _{Tx_CM_DC_ACTIV_E_IDLE_DELTA}	Absolute delta of DC common mode voltage during L0 and electrical idle	0-	-	100	mV
V _{Tx_CM_DC_LINE_DELTA}	Absolute delta of DC common mode voltage between D+ and D-	0-	-	25	mV
V _{Tx_IDLE_DIFFp}	Electrical idle differential peak output voltage	0	--	20	mV
V _{Tx_RCV_DETECT}	Voltage change allowed during receiver detection	--	--	600	mV
V _{Tx_DC_CM}	Tx DC common mode voltage	--	--	3.6	V
I _{Tx_SHORT}	Tx short circuit current limit	--	--	90	mA
T _{Tx_IDLE_MIN}	Minimum time spent in electrical idle	50	--	--	UI
T _{Tx_IDLE_SET_TO_IDLE}	Maximum time to transition to a valid electrical idle after sending an electrical idle ordered set	--	--	20	UI
T _{Tx_IDLE_TO_DIFF_DATA}	Maximum time to transition to valid Tx specifications after leaving an electrical idle condition	--	--	20	UI
RL _{Tx_DIFF}	Differential return loss	10	--	--	dB
RL _{Tx_CM}	Common mode return loss	6	--	--	dB
C _{Tx}	AC coupling capacitor	75	--	200	nF
T _{Crosstalk}	Crosstalk random timeout	0	--	1	ms

3.4.1.2 Differential Rx Input Electricals

Symbol	Parameter	Min	Typ	Max	Units
UI	Unit interval Each UI is 400 ps \pm 300 ppm. UI does not account for SSC dictated variations.	399.98	400	400.12	ps
V _{Rx_DIFFpp}	Differential peak-to-peak voltage $V_{Rx_DIFFpp} = 2* V_{RX-D+} - V_{RX-D-} $	0.175	--	1.2	V
T _{Rx_EYE}	Minimum receiver eye width	0.4	--	--	UI
T _{Rx_EYE_MEDIAN_MAX_JIT}	Maximum time between jitter median and maximum deviation from median	--	--	0.3	UI
V _{Rx_CM_ACp}	AC peak common mode input voltage	--	--	150	mV
RL _{Rx_DIFF}	Differential return loss	10	--	--	dB
RL _{Rx_CM}	Common mode return loss	6	--	--	dB
Z _{Rx_DIFF_DC}	DC differential input impedance	80	100	120	Ω
Z _{Rx_DC}	DC input impedance	40	50	60	Ω
Z _{Rx_HIGH_IMP_DC_POS}	Powered down DC input impedance positive	50	--	--	k
Z _{Rx_HIGH_IMP_DC_NEG}	Powered down DC input impedance negative	1	--	--	k Ω
V _{Rx_IDLE_DET_DIFFpp}	Electrical idle detect threshold	65	--	175	mV
T _{Rx_IDLE_DET_DIFF_ENTERTIME}	Unexpected electrical idle enter detect threshold integration time	--	--	10	ms
L _{Rx_SKEW}	Total skew	---	-2	0	ns

3.4.2.High-Speed UART Interface

The AW-XM458MA supports a high-speed Universal Asynchronous Receiver/Transmitter (UART) interface, compliant to the industry standard 16550 specification. High-speed baud rates are supported to provide the physical transport between the device and the host for exchanging Bluetooth data.



Symbol	Parameter	Condition	Min	Typ	Max	Units
T_BAUD	Baud rate	26MHz input clock	250	-	-	ns



3.5 Timing Sequence

AW-XM458MA power up timing sequence.

TBD

3.6 Power Consumption*

3.6.1 WLAN

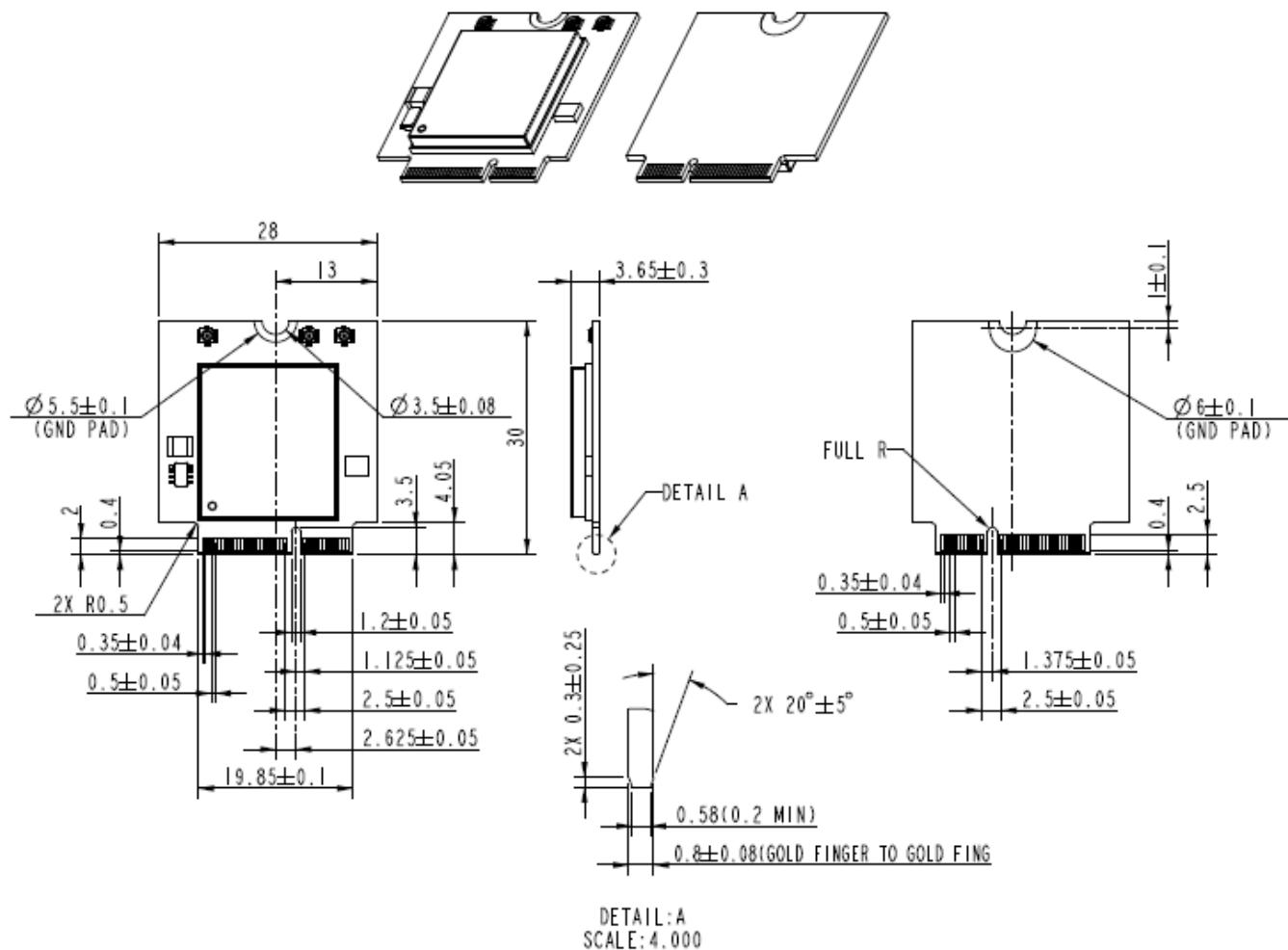
TBD

3.6.2 Bluetooth

TBD

4. Mechanical Information

4.1 Mechanical Drawing



(Draft drawing)



5. Packing Information

TBD