

AW-EB600NF-NV

IEEE 802.11a/b/g/n/ac/ax/be Wireless LAN 2T2R and Bluetooth 5.4 M.2 2230 Combo Module

Datasheet

Rev. B

DF

(For Nvidia)

1

Features

WLAN

- IEEE 802.11 a/b/g/n/ac/ax/be compliant
- Support 20/40 MHz bandwidth in 2.4 GHz band
- Support 20/40/80/160 MHz bandwidth in 5 GHz band and 6 GHz band
- Support MU-MIMO RX
- Support STBC, LDPC and beamforming
- Greenfield, mixed mode, legacy modes support
- IEEE 802.11 d/e/h/i/k/mc/r/v/w support
- Security support for WFA WPA/WPA2/WPA3 personal/enterprise, WPS2.0, FIPS
- QoS support of WFA WMM, WMM PS
- Integrated LNA, PA, and T/R switch

Bluetooth

- Bluetooth specification 2.1+EDR
- Bluetooth 4.2 Low Energy (LE)
- Bluetooth 5.4
- Support BLE Isochronous channel + NBC
- Integrated BALUN and PA
- Scatternet support: Up to 7 piconets simultaneously with background inquiry page scan
- Up to 7 BT links + 16 BLE links
- Support SCO and eSCO links with re-transmission
- Support wide-band speech and hardware accelerated SBC (Sub-Band Codec) for A2DP streaming
- Packet loss concealment
- Channel quality driven data rate adaptation
- Channel assessment and WB RSSI for AFH

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1. Introduction

1.1 Product Overview

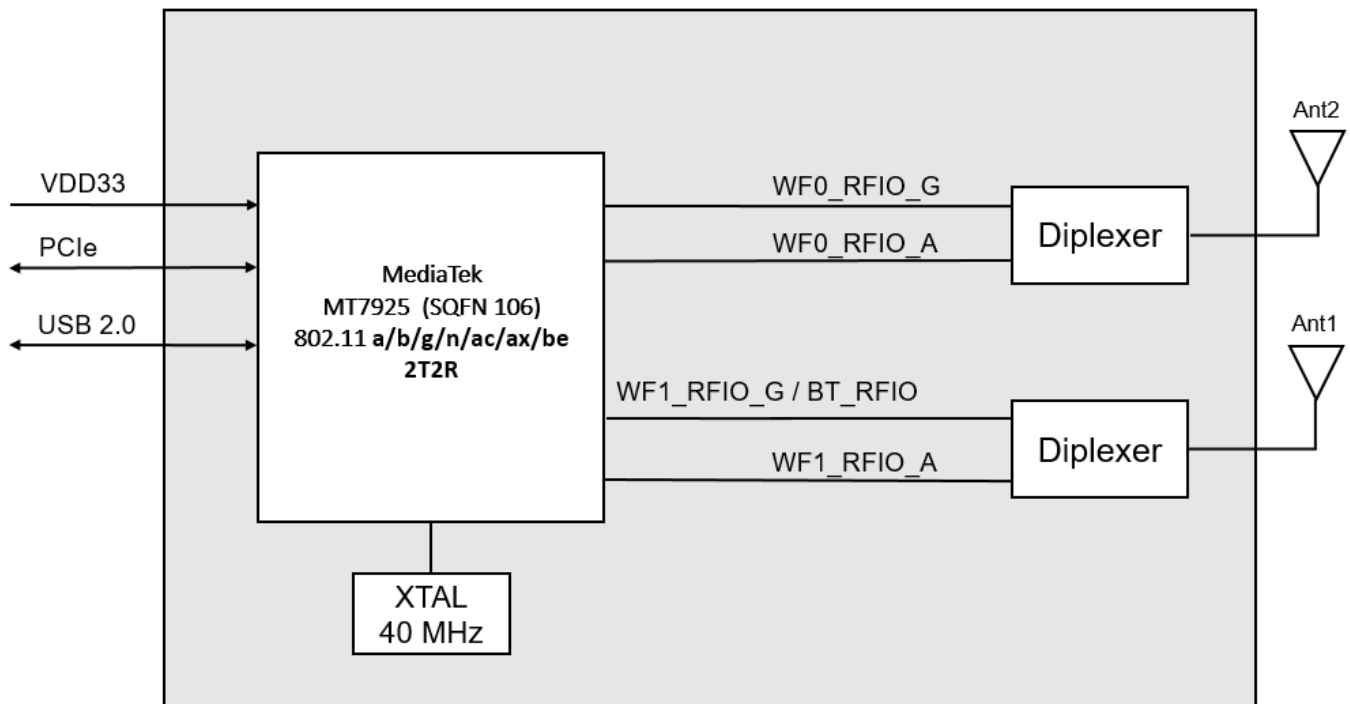
AzureWave Technologies, Inc. introduces the IEEE 802.11 2X2 Wi-Fi 7 with Bluetooth 5.4 combo M.2 module --- **AW-EB600NF-NV**.

AW-EB600NF-NV is a highly integrated single-chip that support 2-stream 802.11ax solutions with Multi-user MIMO (Multiple-Input, Multiple-Output) with Wireless LAN (WLAN) PCI Express network interface controller with integrated Bluetooth 5.4 USB interface controller. It combines a WLAN MAC, a 2T2R capable WLAN baseband, and RF in single chip

AW-EB600NF-NV integrates MediaTek MT7925 SoC with TDD Bluetooth function shared with Wi-Fi antenna.

MT7925 is highly integrated single chip which features a low power 2x2 Wi-Fi 7 dual-band subsystem and a Bluetooth subsystem. The Wi-Fi subsystem contains the 802.11a/b/g/n/ac/ax/be radio, baseband, and MAC that are designed to meet both the low power and high throughput application, and 32-bit RISC MCU to handle Wi-Fi tasks. The Bluetooth subsystem contains the Bluetooth radio, baseband, link controller, and 32-bit RISC MCU for Bluetooth protocols.

1.2 Block Diagram



1.3 Specifications Table

1.3.1 General

Features	Description
Product Description	IEEE 802.11 2x2 WiFi 7 Wireless LAN and Bluetooth 5.4 M.2 2230 Combo Module
Major Chipset	MT7925
Host Interface	Wi-Fi + BT <ul style="list-style-type: none"> ● PCIe + USB
Dimension	22mm x 30mm x 2.3mm (Tolerance remarked in mechanical drawing)
Form Factor	M.2 2230 (Key E)
Antenna	I-PEX MHF4 Connector Receptacle (20449) Main (ANT2) : Wi-Fi → TX/RX Aux (ANT1) : Wi-Fi/Bluetooth → TX/RX
Weight	2.6 g

1.3.2 WLAN

Features	Description
WLAN Standard	IEEE 802.11 a/b/g/n/ac/ax/be 2T2R
WLAN VID/PID	14C3/7925
WLAN SVID/SPID	1A3B/6002
Frequency Range	2.4 GHz : 2.412 ~ 2.484 GHz 5 GHz : 5.180~5.895 GHz 6 GHz : 5.925~ 7.125 GHz
Modulation	DSSS, OFDM, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM, 4096QAM
Number of Channels	2.4GHz <ul style="list-style-type: none"> ■ USA, NORTH AMERICA, Canada and Taiwan – 1 ~ 11 ■ China, Australia, Most European Countries, Japan – 1 ~ 13 5GHz <ul style="list-style-type: none"> ■ 5GHz Number of Channels USA, EUROPE – 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165 ,169 ,173, 177

Output Power at 3.3V and 25°C with mask and EVM compliance (Board Level Limit)*	6GHz ■ 6GHz Number of Channels CH1~CH233				
	2.4GHz				
		Min	Typ	Max	Unit
	11b (11Mbps) @EVM<35%	21	22	23	dBm
	11g (54Mbps) @EVM ≤ -26 dB	18	19	20	dBm
	11n (HT20 MCS7) @EVM ≤ -28 dB	18	19	20	dBm
	11n (HT40 MCS7) @EVM ≤ -28 dB	18	19	20	dBm
	11ax (HE20 MCS11) @EVM ≤ -35 dB	16	17	18	dBm
	11ax (HE40 MCS11) @EVM ≤ -35 dB	15.5	16.5	17.5	dBm
	11be (EHT20 MCS13) @EVM ≤ -38dB	14.5	15.5	16.5	dBm
	11be (EHT40 MCS13) @EVM ≤ -38dB	14.5	15.5	16.5	dBm
	5GHz				
		Min	Typ	Max	Unit
	11a (54Mbps) @EVM ≤ -26 dB	17	18	19	dBm
	11n (HT20 MCS7) @EVM ≤ -28 dB	17.5	18.5	19.5	dBm
	11n (HT40 MCS7) @EVM ≤ -28 dB	17	18	19	dBm
	11ac (VHT20 MCS8) @EVM ≤ -30 dB	16.5	17.5	18.5	dBm
	11ac (VHT40 MCS9) @EVM ≤ -32 dB	16	17	18	dBm
	11ac (VHT80 MCS9) @EVM ≤ -32 dB	16	17	18	dBm
	11ac (VHT160 MCS9) @EVM ≤ -32 dB	14.5	15.5	16.5	dBm
11ax (HE20 MCS11) @EVM ≤ -35 dB	15.5	16.5	17.5	dBm	
11ax (HE40 MCS11) @EVM ≤ -35 dB	15.5	16.5	17.5	dBm	

	11ax (HE80 MCS11) @EVM \leq -35 dB	14.5	15.5	16.5	dBm	
	11ax (HE160 MCS11) @EVM \leq -35 dB	13	14	15	dBm	
	11be (EHT20 MCS13) @EVM \leq -38dB	14	15	16	dBm	
	11be (EHT40 MCS13) @EVM \leq -38dB	14	15	16	dBm	
	11be (EHT80 MCS13) @EVM \leq -38dB	12.5	13.5	14.5	dBm	
	11be (EHT160 MCS13) @EVM \leq -38dB	10.5	11.5	12.5	dBm	
	6GHz (5955~6505MHz)					
		Min	Typ	Max	Unit	
	11ax (HE20 MCS11) @EVM \leq -35 dB	14.5	15.5	16.5	dBm	
	11ax (HE40 MCS11) @EVM \leq -35 dB	14.5	15.5	16.5	dBm	
	11ax (HE80 MCS11) @EVM \leq -35 dB	13.5	14.5	15.5	dBm	
	11ax (HE160 MCS11) @EVM \leq -35 dB	12	13	14	dBm	
	11be (EHT20 MCS13) @EVM \leq -38dB	13	14	15	dBm	
	11be (EHT40 MCS13) @EVM \leq -38dB	13	14	15	dBm	
	11be (EHT80 MCS13) @EVM \leq -38dB	11.5	12.5	13.5	dBm	
	11be (EHT160 MCS13) @EVM \leq -38dB	9.5	10.5	11.5	dBm	
	6GHz (6506~7125MHz)					
		Min	Typ	Max	Unit	
11ax (HE20 MCS11) @EVM \leq -35 dB	13.5	14.5	15.5	dBm		
11ax (HE40 MCS11) @EVM \leq -35 dB	13.5	14.5	15.5	dBm		
11ax (HE80 MCS11) @EVM \leq -35 dB	12.5	13.5	14.5	dBm		
11ax (HE160 MCS11) @EVM \leq -35 dB	11	12	13	dBm		

	11be (EHT20 MCS13) @EVM \leq -38dB	12	13	14	dBm
	11be (EHT40 MCS13) @EVM \leq -38dB	12	13	14	dBm
	11be (EHT80 MCS13) @EVM \leq -38dB	10.5	11.5	12.5	dBm
	11be (EHT160 MCS13) @EVM \leq -38dB	8.5	9.5	10.5	dBm
Receiver Sensitivity	2.4GHz				
		Min	Typ	Max	Unit
	11b (11Mbps)		-90.5	-87.5	dBm
	11g (54Mbps)		-78	-75	dBm
	11n (HT20 MCS7)		-76.5	-73.5	dBm
	11n (HT40 MCS7)		-73	-70	dBm
	11ax (HE20 MCS11)		-66	-63	dBm
	11ax (HE40 MCS11)		-63	-60	dBm
	11be (EHT20MCS13)		-61	-58	dBm
	11be (EHT40MCS13)		-57	-54	dBm
	5GHz				
		Min	Typ	Max	Unit
	11a (54Mbps)		-78	-75	dBm
	11n (HT20 MCS7)		-77	-74	dBm
	11n (HT40 MCS7)		-74	-71	dBm
	11ac(VHT20 MCS8)		-72.5	-69.5	dBm
	11ac(VHT40 MCS9)		-68	-65	dBm
	11ac(VHT80 MCS9)		-65	-62	dBm
	11ac(VHT160 MCS9)		-61.5	-58.5	dBm
	11ax(HE20 MCS11)		-66	-63	dBm
11ax(HE40 MCS11)		-63	-60	dBm	
11ax(HE80 MCS11)		-60	-57	dBm	
11ax(HE160 MCS11)		-57	-54	dBm	
11be(EHT20 MCS13)		-60.5	-57.5	dBm	
11be(EHT40 MCS13)		-57	-54	dBm	
11be(EHT80 MCS13)		-54	-51	dBm	
11be(EHT160MCS13)		-51	-48	dBm	

	6GHz		Min	Typ	Max	Unit
	11ax(HE20 MCS11)			-65	-62	dBm
	11ax(HE40 MCS11)			-62.5	-59.5	dBm
	11ax(HE80 MCS11)			-59	-56	dBm
	11ax(HE160 MCS11)			-56	-53	dBm
	11be(EHT20 MCS13)			-60.5	-57.5	dBm
	11be(EHT40 MCS13)			-56.5	-53.5	dBm
	11be(EHT80 MCS13)			-54	-51	dBm
	11be(EHT160MCS13)			-52.5	-49.5	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 300Mbps(40MHz channel) ■ 802.11ac:up to 1.6Gbps (160MHz channel) ■ 802.11ax:up to 2.4Gbps (160MHz channel) ■ 802.11be:up to 2.8Gbps (160MHz channel) 					
Security	<ul style="list-style-type: none"> ■ 64-bit WEP (WEP-40) and 128-bit WEP (WEP-104) encryption with hardware TKIP and CKIP processing ■ AES-CCMP hardware processing ■ GCMP hardware processing 					

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

1.3.3 Bluetooth

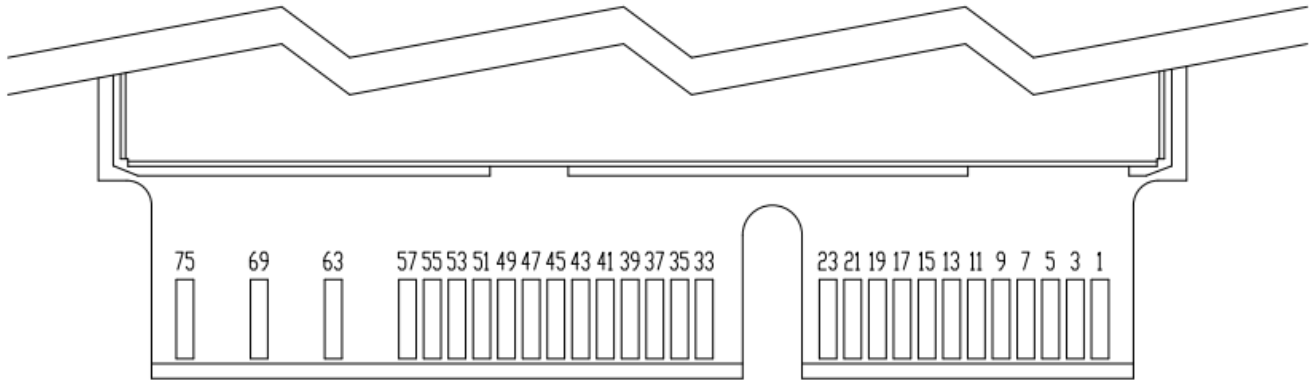
Features	Description					
Bluetooth Standard	Bluetooth 2.1 and 3.0+Enhanced Data Rate (EDR) + BT 5.4					
Bluetooth VID/PID	13D3/3604					
Frequency Range	2402~2480MHz					
Modulation	GFSK (1Mbps), $\pi/4$ DQPSK (2Mbps) and 8DPSK (3Mbps)					
Output Power		Min	Typ	Max	Unit	
	BDR		10		dBm	
	EDR		7		dBm	
	BLE		10		dBm	
Receiver Sensitivity	BER < 0.1%					
		Min	Typ	Max	Unit	
	BDR (BER<0.1%)		-90		dBm	
	EDR ($\pi/4$ DQPSK) (BER<0.01%)		-89		dBm	
	EDR (8PSK) (BER<0.01%)		-82		dBm	
	BLE(1M) (PER<-30.8%)		-92		dBm	
	BLE(2M) (PER<-30.8%)		-92		dBm	

1.3.4 Operating Conditions

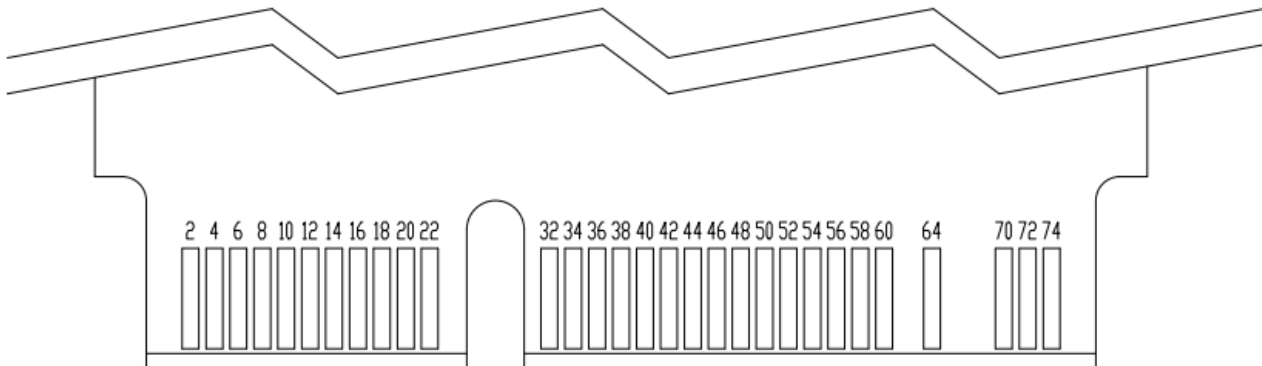
Features	Description
Operating Conditions	
Voltage	Power supply for host:3.3V
Operating Temperature	-10~70 °C
Operating Humidity	less than 85% R.H.
Storage Temperature	-40~105 °C
Storage Humidity	less than 60% R.H.
Thermal Shield Performance Target	Full performance at shield temperatures up to 90°C

2. Pin Definition

2.1 Pin Map



PIN DEFINED (TOP VIEW)



PIN DEFINED (BOTTOM VIEW)

2.2 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	LED1#	Active low. These signals are used to allow the add-in card to provide WLAN status indicators via LED devices that will be provided by the system.	3.3V	Output
7	GND	Ground.		GND
8	PCM_CLK	PCM Clock	1.8V	Input
9	NC	Floating Pin, No connect to anything.		Floating
10	PCM_SYNC	PCM synchronous data SYNC	1.8V	Output
11	NC	Floating Pin, No connect to anything.		Floating
12	PCM_OUT	PCM synchronous data OUTput	1.8V	Output
13	NC	Floating Pin, No connect to anything.		Floating
14	PCM_IN	PCM synchronous data INput	1.8V	Input
15	NC	Floating Pin, No connect to anything.		Floating
16	LED2#	Active low. These signals are used to allow the add-in card to provide BT status indicators via LED devices that will be provided by the system	3.3V	Output
17	NC	Floating Pin, No connect to anything.		Floating
18	GND	Ground.		GND
19	NC	Floating Pin, No connect to anything.		Floating
20	NC	Floating Pin, No connect to anything.		Floating
21	NC	Floating Pin, No connect to anything.		Floating
22	NC	Floating Pin, No connect to anything.		Floating
23	NC	Floating Pin, No connect to anything.		Floating
32	NC	Floating Pin, No connect to anything.		Floating
33	GND	Ground.		GND
34	NC	Floating Pin, No connect to anything.		Floating

35	PERp0	Differential receive.	1.8V	Input
36	NC	Floating Pin, No connect to anything.		Floating
37	PERn0	Differential receive.	1.8V	Input
38	NC	Floating Pin, No connect to anything.		Floating
39	GND	Ground.		GND
40	NC	Floating Pin, No connect to anything.		Floating
41	PETp0	Differential transmit.	1.8V	Output
42	NC	Floating Pin, No connect to anything.		Floating
43	PETn0	Differential transmit.	1.8V	Output
44	NC	Floating Pin, No connect to anything.		Floating
45	GND	Ground.		GND
46	COEX_TXD	LTE PTA_TX, optional	1.8V	Input
47	REFCLKP	Differential reference clock.	1.8V	Input
48	COEX_RXD	LTE PTA_RX, optional	1.8V	Input
49	REFCLKN	PCIe Differential Reference Clock source	1.8V	Input
50	NC	Floating Pin, No connect to anything.		Floating
51	GND	Ground.		GND
52	PERST_N	PCIe reset signal: active low. When the PERST# is asserted at power-on state, this module IC returns to a pre-defined reset state and is ready for initialization and configuration after the de-assertion of the PERST#. (Recommend external pull-up to 3.3V)	1.8V/ 3.3V	Input
53	CLKREQ0	Reference clock request signal. Also used by L1 PM sub-states. This signal is used by this module IC to request for the PCIe reference clock.	1.8V/ 3.3V	
54	BT_RF_DISABLE#	Active low. This pin can external shut down the BT function when this pin is pull low. When this pin is pull low, USB interface will be also disabled. When this function is not required, external pull high is not required.	1.8V/ 3.3V	Input
55	PEWAKE#	Power management event: open drain, active low. Used to reactivate the PCIe slot's main power rails and reference clocks. An external pull-up resistor to 3.3V is required	1.8V/ 3.3V	
56	WF_RF_DISABLE#	Active low. This pin can be defined as the WLAN radio-off function with host interface remaining connected. When this pin is pulled low, WLAN function will be radio-off.	1.8V/ 3.3V	Input

		When this function is not required, external pull high is not required		
57	GND	Ground.		GND
58	NC	Floating Pin, No connect to anything.		Floating
59	NC	No golden finger		
60	NC	Floating Pin, No connect to anything.		Floating
61	NC	No golden finger		
62	NC	No golden finger		
63	GND	Ground.		GND
64	NC	Floating Pin, No connect to anything.		Floating
65	NC	No golden finger		
66	NC	No golden finger		
67	NC	No golden finger		
68	NC	No golden finger		
69	GND	Ground.		GND
70	NC	Floating Pin, No connect to anything.		Floating
71	NC	No golden finger		
72	VDD33	3.3V power supply	3.3V	VCC
73	NC	No golden finger		
74	VDD33	3.3V power supply	3.3V	VCC
75	GND	Ground.		GND

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VDD33	3.3V supply voltage	-0.3	3.3	3.63	V
Tstg	Storage temperature	-40	-	125	°C

3.2 Recommended Operating Conditions

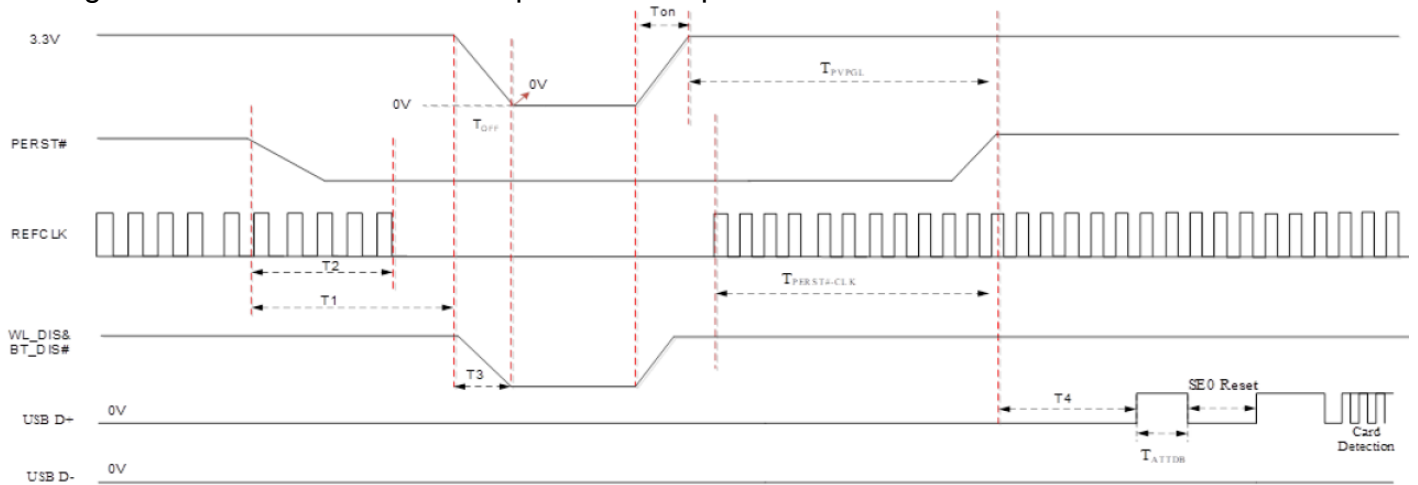
Symbol	Parameter	Minimum	Typical	Maximum	Unit
VDD33	3.3V supply voltage	3.135	3.3	3.465	V
TAMBIENT	Ambient temperature	-10	-	70	°C

3.3 Digital IO Pin DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VIL	Input low voltage	-0.3		VDD33*0.25	V
VIH	Input high voltage	VDD33*0.625		VDD33+0.3	V
VOL	Output low voltage	-0.3		VDD33*0.125	V
VOH	Output high voltage	VDD33*0.75		VDD33+0.3	V

3.4 Power-On Sequence

The figure below shows the module power on sequence.



Symbol	Unit	Min	Max
T_{on}	ms	0.1	5
T_{off}	ms	0.1	
T_{PVGL}	ms	50	
T_{PERST#-CLK}	us	100	
T_{ATTDB}	ms	100	
T_{SEO Reset}	ms	10	
T₁	ms	0	
T₂	ms	0	
T₃	ms	0	

3.5 PCIE interface

AW-EB600NF-NV supports PCI Express End Point which is fully compliant with the PCI Express Base Specification Revision 2.1. It supports PCI Express Gen1 (2.5Gbps) and PCIE Express Gen2 (5.0Gbps) differential bus speed.

AW-EB600NF-NV supports PCI Express low power operations such as ASPM L1.0, ASPM L1.CLK_PM, ASPM L1.SS (L1.1 and L1.2), and PCI PM L2 state. It also supports WAKE_N for device wakeup host scenario, as well as remote wake-up signaling.

The PCI Express interface is only used for Wi-Fi operations. The DMA ring and the data structure are controlled by the descriptor-based PDMA engine over PCI Express interface.

3.6 USB interface

AW-EB600NF-NV supports USB device port which is fully compliant with the Universal Serial Bus Specification, Revision v2.0 (USB v2.0 specification). It supports high-speed mode, suspend/ resume signaling, as well as remote wake-up signaling.

3.7 Power Consumption

Driver Package

[MTK_WLAN_V5.3.0.1417_BT_V1.1037.0.399](#)

3.7.1 WLAN

Static Test

Mode		Vcc = 3.3V					
		Disable ASPM			L1 Mode		
		2.4G	5G	6G	2.4G	5G	6G
WLAN RF OFF(Note1)		48.2			0.7		
No connection with wireless AP	AVG	55.1			10.9		
	MAX	212.2			168.5		
Connection AP	AVG	96.4	138.3	115.5	54.2	88.2	73.6
	MAX	213.8	251.5	271.5	184.5	206.2	227.9

Unit: mA

Note1: WLAN RF off test using SW radio off by windows

Note2: Connect AP: Netgear RS700s (2.4G: 11be BW40Mhz, 5G: 11be BW160Mhz, 6G: 11be BW160Mhz)

Dynamic Test

Band (GHz)	Mode	BW (MHz)	Link Speed (bps)	Transmit		Receive	
				Max.	Avg.	Max.	Avg.
2.4	802.11b	20	11M	688.1	596.3	317.2	291.1
	802.11g	20	54M	448.7	432.7	228.6	222.3
	802.11n	20	144.4M	656.6	632.2	204.5	194.0
		40	300M	584.9	561.9	226.5	217.1
	802.11ax	20	286.8M	624.6	604.3	211.3	199.9
		40	573.5M	622.7	600.6	235.4	221.4
802.11be	20	344.1M	582.8	543.1	201.0	186.2	
	40	688.2M	587.2	547.2	218.9	210.0	
5	802.11a	20	54M	581.1	559.8	301.0	291.3
	802.11n	20	144.4M	985.2	963.6	297.4	262.3
		40	300M	850.3	811.6	294.5	274.2
	802.11ac	20	173.3M	900.9	864.1	260.6	243.9
		40	400M	908.9	873.9	285.6	268.4
		80	866.7M	894.1	841.7	339.1	315.2
	802.11ax	160	1733.3M	913.2	868.8	419.1	395.2
		20	286.8M	907.4	831.3	282.5	266.0
		40	573.5M	896.0	822.6	301.3	285.5
		80	1201M	912.4	848.3	334.3	323.5
	160	2402M	918.2	871.0	446.5	420.8	

	802.11be	20	344.1M	934.4	824.7	317.1	292.0
		40	688.2	959.9	815.4	314.4	288.4
		80	1441.2	1005.7	845.0	354.8	330.1
		160	2882.4	1017.0	851.1	424.2	410.8
6	802.11ax	20	286.8M	724.6	698.4	285.5	275.0
		40	573.5M	791.5	763.8	313.6	296.4
		80	1201M	845.4	819.2	358.6	341.4
		160	2402M	933.7	875.2	442.3	413.5
	802.11be	20	344.1M	743.4	701.9	265.9	246.6
		40	688.2M	814.3	748.1	275.0	264.0
		80	1441.2M	883.5	797.8	346.3	326.2
		160	2882.4M	1057.1	885.2	489.9	403.3

Unit: mA

Note:

1. NB1 operated in DC (battery) mode.
2. 11b/11a/5G 11n :Linksys EA8500, 11ac/ax: Netgear RAXE500 / 11be: Netgear RS700s
3. Netgear RS700s 11be @5G & 6G not support BW 20Mhz, when test EHT20 mode, change DUT BW to 20Mhz by manual from device manager.

3.7.2 Bluetooth

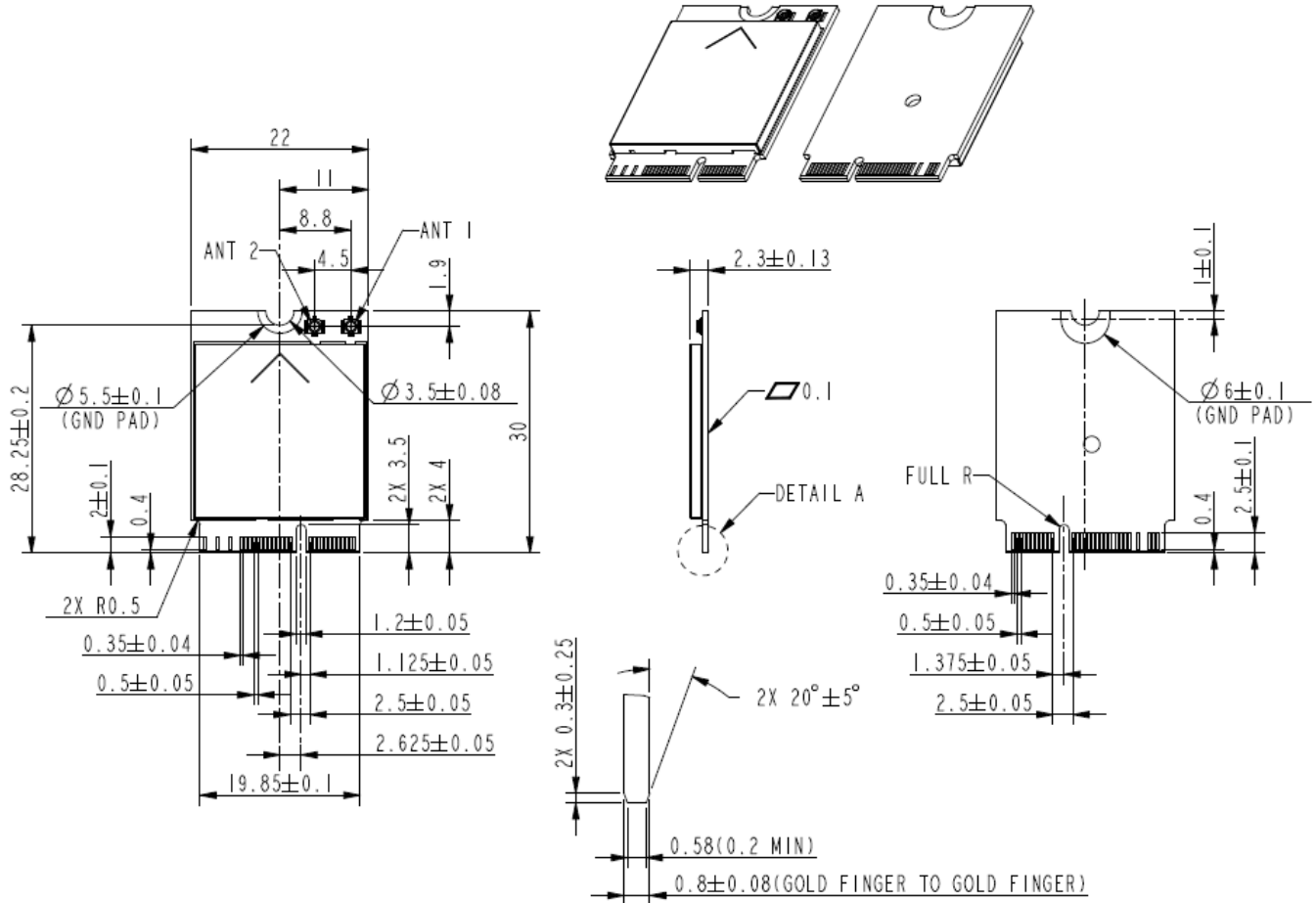
No.	Mode	Vcc = 3.3 V	
		Max.	Avg.
1	Bluetooth RF Off(Note1)	1.0	0.7
2	No Connection with any BT device	19.4	6.5
3	Connect BT Device	36.2	11.4
4	Transmit by BER 2.1	66.2	49.7
5	Receiver by BER 2.1	43.3	39

Unit: mA

Note1: BT RF off test using SW radio off by windows

4. Mechanical Information

4.1 Mechanical Drawing



DETAIL: A
SCALE: 4.000

TOLERANCE UNLESS OTHERWISE SPECIFIED: ± 0.15 mm

5. Package information

5.1 Module Label level package

TBD