EWN-8852BER3BB-HF

SPECIFICATION V1.0

IEEE 802.11ax/ac/a/b/g/n 2T2R WLAN with PCIE Interface

+ Bluetooth 5 with HS-UART Interface Module

Contents

1 General Specifications

The module provides a complete solution for a high-performance integrated wireless and Bluetooth device. It supports 2-stream 802.11ax solutions with Multi-user MIMO (Multiple- Input, Multiple-Output) with Wire LAN (WLAN) PCI Express network interface controller with Bluetooth 5 HS-UART interface controller. The module complies with IEEE 802.11 ax/ac/b/g/n/ 2T2R MIMO standard, and Provides up to 1201Mbps for IEEE802.11ax MIMO OFDM.

2 Features

2.1 WLAN

- IEEE802.11a/b/g/n/ac/ax compatible WLAN
- Supports 802.11ac/ax 2x2, Wave-2 compliant with MU-MIMO
- Completes 802.11n MIMO solution for 2.4GHz and 5GHz band
- Complies with PCI Express Base Specification Revision 1.1
- PCIe LTR/L1. Off state supported
- Maximum PHY data rate up to 286.8Mbps using 20MHz bandwidth, 573.5Mbps using 40MHz bandwidth, and 1201Mbps using 80MHz bandwidth
- Maximum data rate 54Mbps in 802.11g, 300Mbps in 802.11n and 866.7Mbps in 802.11ac, 1201Mbps in 802.11ax
- Backward compatible with 802.11a/b/g devices while operating at 802.11n data rates
- Backward compatible with 802.11a/n/ac devices while operating at 802.11ax data rates
- IEEE802.11e QoS Enhancement(WMM)
- IEEE802.11i (WPA,WPA2,WPA3). Open, shared key, and pair-wise key authentication services
- IEEE 802.11h DFS, TPC, Spectrum Measurement
- IEEE 802.11k Radio Resource Measurement
- Channel management and co-existence
- Wi-Fi Direct supports wireless peer to peer applications. Support BSR and queue size of Qos
- Support DFS, Channel info, PPDU state by RX path
- Support TWT function for power saving

- Support S3/S4 AES/TKIP group key update
- FTM support distance measurement
- Support Network List Offload
- Supports TCP/UDP/IP checksum offload
- DSSS with DBPSK and DQPSK, CCK modulation with long and short preamble
- OFDM with BPSK, QPSK, 16QAM, 64QAM and 256 QAM modulation. Convolutional Coding Rate: 1/2, 2/3, 3/4 and 5/6

2.2 Bluetooth

- Complies with HS-UART with configurable baud rate for Bluetooth
- Supports Bluetooth 5 Systems (BT 5.2 Logo compliant)
- Compatible with Bluetooth v2.1+EDR
- Supports all packet type in basic rate and enhanced data rate
- Supports Secure Simple Pairing
- Dual Mode support: Simultaneous LE and BR/EDR
- Supports multiple Low Energy states
- Supports Enhanced Power Control
- Integrated 32K oscillator for power management

3 System Block Diagram

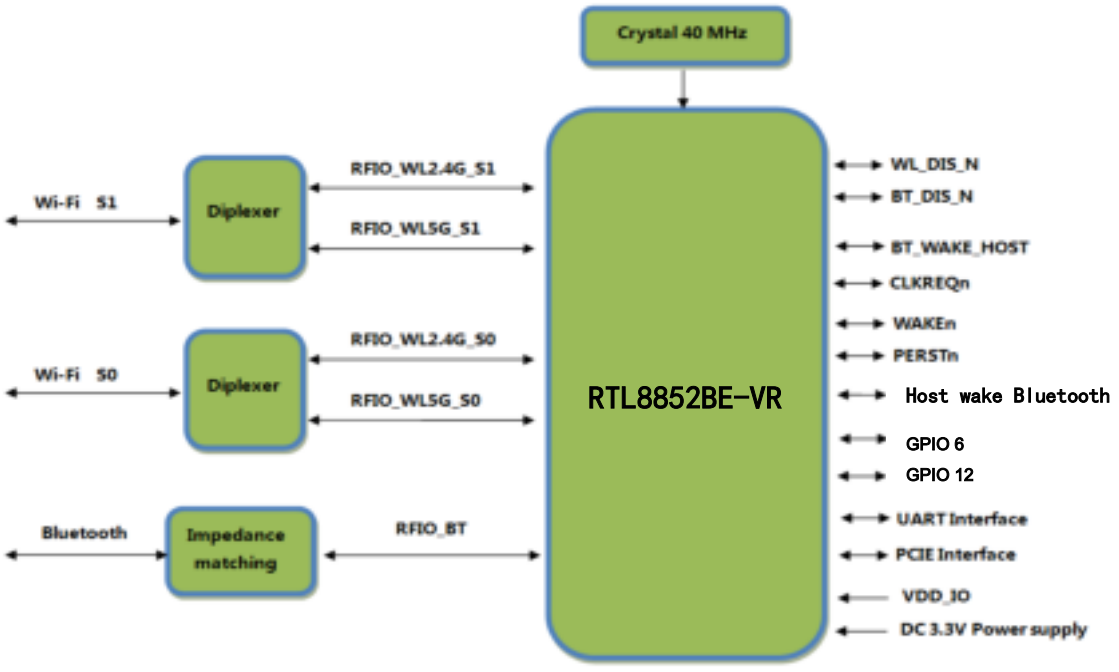


FIG 1 EWN-8852BER3BB-HF Block Diagram

4 PHY Specification

4.1 Wi-Fi Specification

Table 1 EWN-8852BER3BB-HF Wi-Fi RF Parameters

Protocol	IEEE 802.11b/g/n/a/ac/ax	
Interface	PCIE1.1	
Modulation	BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM/DBPSK/DQPSK/CCK	
Frequency	2.4GHz band CH1~CH14/2400 -2483.5MHz	
	5GHz Band CH36~CH48/5150-5250MHz CH52~CH64/5250-5350MHz CH100~CH140/5470-5725MHz CH149~CH165/5725-5850MHz	
	2.4G&5G Band Refer to Channel Plan Domain Code	
Bandwidth	20/40/80 MHz	
PHY Rate	Maximum PHY data rate up to 286.8 Mbps using 20MHz bandwidth;	
	Maximum PHY data rate up to 573.5 Mbps using 40MHz bandwidth;	
	Maximum PHY data rate up to 1201 Mbps using 80MHz bandwidth .	
Frequency Error	<±10ppm/802.11b/g/n/a/ac/ax	
Mask	-20dB/±11MHz/OFDM;	
	-28dB/±20MHz/OFDM;	
	-30dB/±11MHz/DSSS, CCK;	
	-50dB/±20MHz/DSSS, CCK.	
2.4G Transmit Power	802.11b (2.4G 11Mbps):	17±2dBm
	802.11g (2.4G 54Mbps):	16±2dBm
	802.11n (2.4G HT20 MCS7):	15±2dBm
	802.11n (2.4G HT40 MCS7):	15±2dBm
	802.11ax (2.4G HE20 MCS11):	13±2dBm
	802.11ax (2.4G HE40 MCS11):	13±2dBm
	TX power base on the “TXPWR_ByRate” and is the driver profile , If you need refer to the FCC certification data and TX power configuration for module, please consult eardatek.	
2.4G EVM	802.11b (2.4G 11Mbps):	≤-15dB
	802.11g (2.4G 54Mbps):	≤-28dB

	802.11n (2.4G HT20 MCS7):	≤-30dB	
	802.11n (2.4G HT40 MCS7):	≤-30dB	
	802.11ax (2.4G HE20 MCS11):	≤-36dB	
	802.11ax (2.4G HE40 MCS11):	≤-36dB	
5G Transmit Power	802.11a(5G 54Mbps):	16±2dBm	
	802.11n (5G HT20 MCS7):	15±2dBm	
	802.11n (5G HT40 MCS7):	15±2dBm	
	802.11ac (5G VHT20 MCS8):	14±2dBm	
	802.11ac (5G VHT40 MCS9):	13±2dBm	
	802.11ac (5G VHT80 MCS9):	13±2dBm	
	802.11ax (5G HE20 MCS10):	13±2dBm	
	802.11ax (5G HE20 MCS11):	13±2dBm	
	802.11ax (5G HE40 MCS10):	13±2dBm	
	802.11ax (5G HE40 MCS11):	13±2dBm	
	802.11ax (5G HE80 MCS10):	13±2dBm	
	802.11ax (5G HE80 MCS11):	13±2dBm	
	TX power base on the “TXPWR_ByRate” and is the driver profile， If you need refer to the FCC certification data and TX power configuration for module, please consult eardatek.		
5G EVM	802.11a(5G 54Mbps):	≤-28dB	
	802.11n(5G HT20 MCS7):	≤-30dB	
	802.11n(5G HT40 MCS7):	≤-30dB	
	802.11ac(5G VHT20 MCS8):	≤-33dB	
	802.11ac(5G VHT40 MCS9):	≤-35dB	
	802.11ac(5G VHT80 MCS9):	≤-35dB	
	802.11ax(5G HE20 MCS10):	≤-36dB	
	802.11ax(5G HE20 MCS11):	≤-36dB	
	802.11ax(5G HE40 MCS10):	≤-36dB	
	802.11ax(5G HE40 MCS11):	≤-36dB	
	802.11ax(5G HE80 MCS10):	≤-36dB	
	802.11ax(5G HE80 MCS11):	≤-36dB	
2.4G Receive Sensitivity @ PER<10%	802.11b (2.4G 1Mbps):	-91dBm (Max.)	-97dBm (Typ.)
	802.11b (2.4G 11Mbps):	-85dBm (Max.)	-91dBm (Typ.)
	802.11g (2.4G 6Mbps):	-87dBm (Max.)	-96dBm (Typ.)

	802.11g (2.4G 24Mbps):	-79dBm (Max.)	-86dBm (Typ.)
	802.11g (2.4G 54Mbps):	-70dBm (Max.)	-77dBm (Typ.)
	802.11n (2.4G HT20 MCS0):	-87dBm (Max.)	-94dBm (Typ.)
	802.11n (2.4G HT20 MCS4):	-75dBm (Max.)	-81dBm (Typ.)
	802.11n (2.4G HT20 MCS7):	-69dBm (Max.)	-74dBm (Typ.)
	802.11n (2.4G HT40 MCS0):	-84dBm (Max.)	-91dBm (Typ.)
	802.11n (2.4G HT40 MCS4):	-72dBm (Max.)	-76dBm (Typ.)
	802.11n (2.4G HT40 MCS7):	-66dBm (Max.)	-71dBm (Typ.)
	802.11ax (2.4G HE20 MCS10):	-57dBm (Max.)	-59dBm (Typ.)
	802.11ax (2.4G HE20 MCS11):	-55dBm (Max.)	-57dBm (Typ.)
	802.11ax (2.4G HE40 MCS10):	-55dBm (Max.)	-57dBm (Typ.)
	802.11ax (2.4G HE40 MCS11):	-53dBm (Max.)	-55dBm (Typ.)
5G Receive Sensitivity @ PER<10%	802.11a (5G 6Mbps):	-87dBm (Max.)	-92dBm (Typ.)
	802.11a (5G 24Mbps):	-79dBm (Max.)	-85dBm (Typ.)
	802.11a (5G 54Mbps):	-70dBm (Max.)	-75dBm (Typ.)
	802.11n (5G HT20 MCS0):	-87dBm (Max.)	-92dBm (Typ.)
	802.11n (5G HT20 MCS4):	-75dBm (Max.)	-78dBm (Typ.)
	802.11n (5G HT20 MCS7):	-69dBm (Max.)	-72dBm (Typ.)
	802.11n (5G HT40 MCS0):	-84dBm (Max.)	-89dBm (Typ.)
	802.11n (5G HT40 MCS4):	-72dBm (Max.)	-75dBm (Typ.)
	802.11n (5G HT40 MCS7):	-66dBm (Max.)	-69dBm (Typ.)
	802.11ac (5G VHT20 MCS0):	-87dBm (Max.)	-94dBm (Typ.)
	802.11ac (5G VHT20 MCS5):	-71dBm (Max.)	-76dBm (Typ.)
	802.11ac (5G VHT20 MCS8):	-64dBm (Max.)	-68dBm (Typ.)
	802.11ac (5G VHT40 MCS0):	-84dBm (Max.)	-90dBm (Typ.)
	802.11ac (5G VHT40 MCS5):	-68dBm (Max.)	-73dBm (Typ.)
	802.11ac (5G VHT40 MCS9):	-59dBm (Max.)	-63dBm (Typ.)
	802.11ac (5G VHT80 MCS0):	-81dBm (Max.)	-87dBm (Typ.)
	802.11ac (5G VHT80 MCS5):	-65dBm (Max.)	-69dBm (Typ.)
	802.11ac (5G VHT80 MCS9):	-56dBm (Max.)	-60dBm (Typ.)
	802.11ax (5G HE20 MCS10):	-57dBm (Max.)	-59dBm (Typ.)
	802.11ax (5G HE20 MCS11):	-55dBm (Max.)	-57dBm (Typ.)
	802.11ax (5G HE40 MCS10):	-55dBm (Max.)	-57dBm (Typ.)

	802.11ax (5G HE40 MCS11):	-53dBm (Max.)	-55dBm (Typ.)
	802.11ax (5G HE80 MCS10):	-53dBm (Max.)	-55dBm (Typ.)
	802.11ax (5G HE80 MCS11):	-51dBm (Max.)	-53dBm (Typ.)

4.2 BT Specification

Table 2 EWN-8852BER3BB-HF Bluetooth RF Parameters

Protocol	BTv2.1+EDR/BTv3.0/BTv3.0+HS/BT v4.2/BT v5.0
Interface	UART
Frequency	2400 MHz ~ 2483.5 MHz (79 channels)
Modulation	GFSK, π/4-DQPSK, 8-DPSK
PHY Rate	1 Mbps for Basic Rate; 2、3 Mbps for Enhanced Data Rate; 1、2 Mbps for BLE
Transmit Power	6dBm, typical
Receive Sensitivity	<-89dBm @ BER=0.1% for GFSK (1Mbps); <-86dBm @ BER=0.01% for π/4-DQPSK (2Mbps); <-83dBm @ BER=0.01% for 8-DPSK (3Mbps); <-90dBm @ PER=30.8% for BLE

5 Other Specifications

Table 3 Other Specification

Ambient Operating Temperature	0℃~+70℃
Storage Temperature	Module: -20℃~+125℃ Package: -20℃~+70℃
Operating Humidity	RH 95%(Non-Condensing)
Storage Humidity	RH 95%(Non-Condensing)
Humidity level	Level 3
Security	WEP 64/128bit,WPA,WPA2,WPA3,TKIP,AES
Other characteristics:	QoS-WMM, WMM-PS
Operation System	Linux/Android/Win
ESD(IEC61000-4-2)	≥±800V(Contact) @ RF Port

6 DC Characteristics

Table 4 Power Supply Characteristics

Symbol	Parameter	Min.	Typical	Max.	Unit
VDD_3.3V	3.3V Supply Voltage	3.0	3.3	3.6	V
IDD_3.3V	3.3V Rating Current	-	-	2000	mA
VDDIO	I/O Voltage	1.8V or 3.3V			

7 Module configurations

Module Dimension (L*W*T)： 15.2±0.2mm*13.2±0.2mm*2.15±0.2mm。

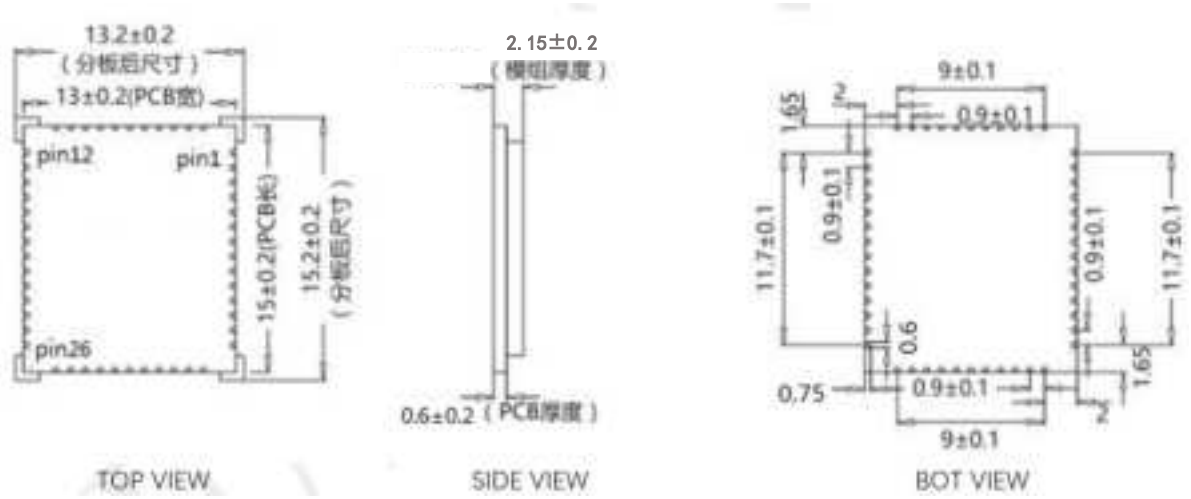


FIG2 EWN-8852BER3BB-HF Module Dimension

Recommended Footprint :

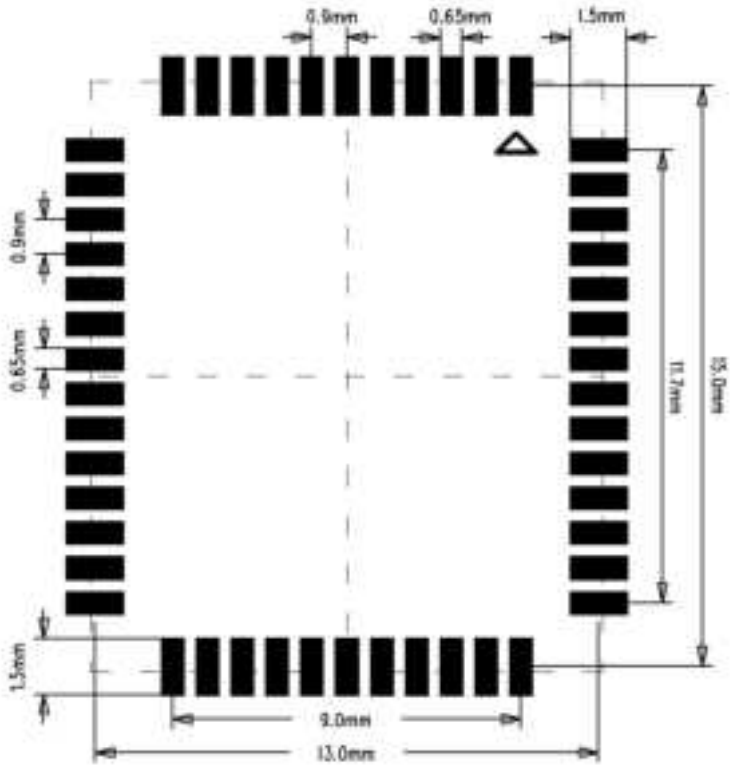


FIG 3 EWN-8852BER3BB-HF Module Dimension

8 Pin Definition

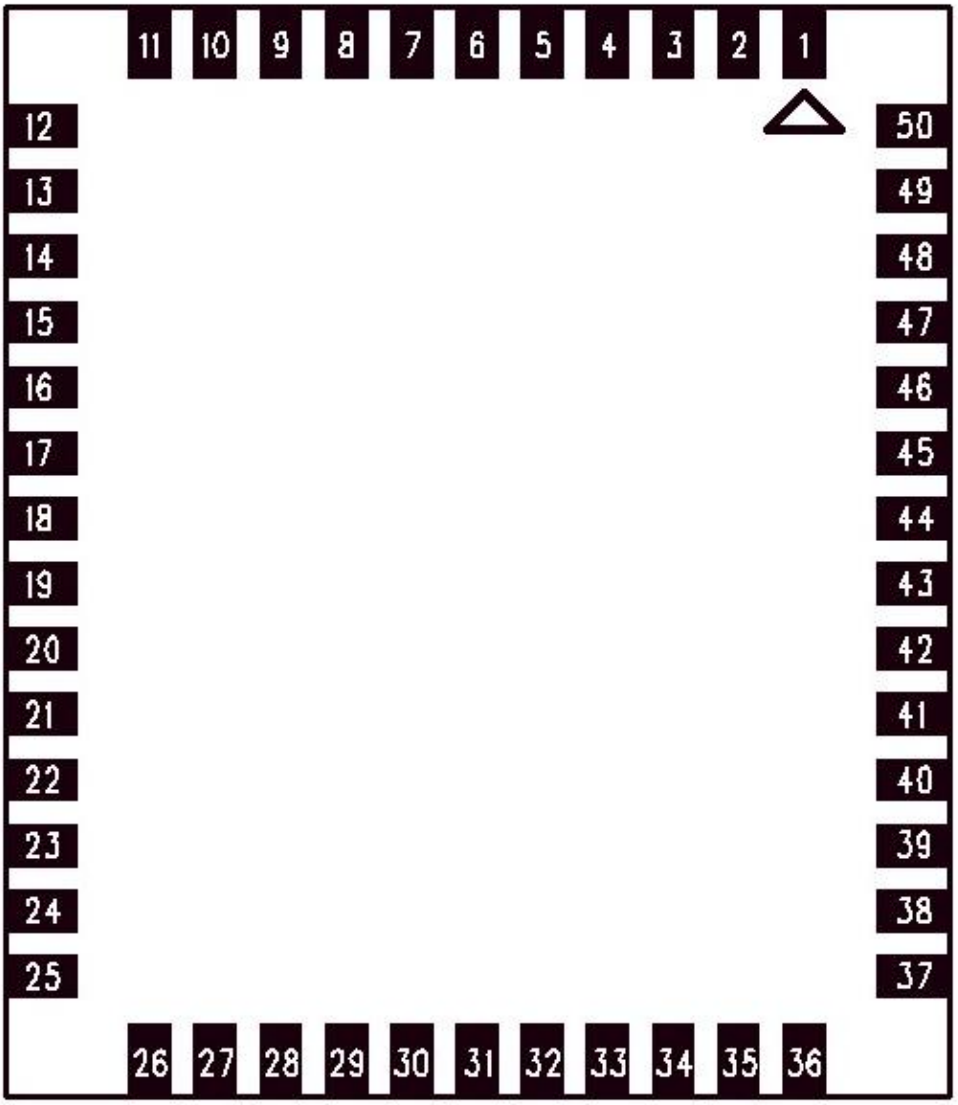


FIG 4 TOP VIEW

See table 5 for the module hardware pin definition.

Table 5 EWN-8852BER3BB-HF Pin Description

Pin	Definition	Description	Power Supply	Power level
1	GND	Ground	-	-
2	RF_WL_S1	Wi-Fi Path S1 ANT I/O port	-	-
3	GND	Ground	-	-
4	GND	Ground	-	-

Pin	Definition	Description	Power Supply	Power level
5	GND	Ground	-	-
6	GND	Ground	-	-
7	GND	Ground	-	-
8	GND	Ground	-	-
9	RF_WL_S0	Wi-Fi Path S0 ANT I/O port	-	-
10	GND	Ground	-	-
11	GND	Ground	-	-
12	PERSTn	PCIE reset, active low	VDD_3.3V	DC 3.3V±0.3V
13	NC	No connect	-	-
14	NC	No connect	-	-
15	WL_DIS_N	Shut down the WLAN when is pulled low	VDDIO	Depend On VDDIO
16	WAKEn	Used to reactivate the PCIE slot's main power rails and reference	VDD_3.3V	DC 3.3V±0.3V
17	GPIO6	General Purpose Input/Output Pin	VDDIO	Depend On VDDIO
18	GPIO12	General Purpose Input/Output Pin	VDDIO	Depend On VDDIO
19	PCM_OUT	PCM data output	VDDIO	Depend On VDDIO
20	PCM_IN	PCM data input	VDDIO	Depend On VDDIO
21	PCM_SYNC	PCM SYNC signal	VDDIO	Depend On VDDIO
22	PCM_CLK	PCM clock	VDDIO	Depend On VDDIO
23	GND	Ground	-	-
24	NC	No connect	-	-
25	NC	No connect	-	-
26	NC	No connect	-	-
27	GND	Ground	-	-
28	NC	No connect	-	-
29	NC	No connect	-	-
30	GND	Ground	-	-
31	NC	No connect	-	-
32	GND	Ground	-	-
33	REFCLK-	PCIE difference Reference clock - (100MHz±300ppm)	-	-
34	VDDIO	I/O voltage supply input (1.8V typ.)	VDDIO	1.8V or 3.3V
35	REFCLK+	PCIE difference Reference clock +	-	-

Pin	Definition	Description	Power Supply	Power level
		(100MHz±300ppm)		
36	VDD_3.3V	Main power voltage source input (3.3V±0.3V)	Main power	DC 3.3V±0.3V
37	CLKREQn	The module to request for the PCIE clock reference signal	VDD_3.3V	DC 3.3V±0.3V
38	BT_DIS_N	Shut down the BT when is pulled low	VDDIO	Depend On VDDIO
39	GND	Ground	-	-
40	UART_TXD	Bluetooth UART interface(connect to host UART RX)	-	-
41	UART_RXD	Bluetooth UART interface(connect to host UART TX)	-	-
42	UART_RTS	Bluetooth UART interface	-	-
43	UART_CTS	Bluetooth UART interface	-	-
44	HSIN	PCIE Receive difference pair -	-	-
45	HSIP	PCIE Receive difference pair +	-	-
46	HSON	PCIE Transmit difference pair -	-	-
47	HSOP	PCIE Transmit difference pair +	-	-
48	RF_BT	Bluetooth ANT I/O port	-	-
49	HOST_WAKE_BT	Host to wake-up the Bluetooth	VDDIO	Depend On VDDIO
50	BT_WAKE_HOST	Bluetooth to wake-up the host	VDDIO	Depend On VDDIO

9 Key material list

Table 6 EWN-8852BER3BB-HF Key material list

Type	Model	Footprint	QTY.
Diplexers	DPX166000DT-8093A1(TDK)	1608	2PCS
	LD18D2450LAN-D86/N(佳利)		
IC	RTL8852BE-VR-CG	QFN76	1 PCS
Crystal	40MHz （CX/YDL/JWT/TJ ）	X3225	1 PCS

10 Module Photos

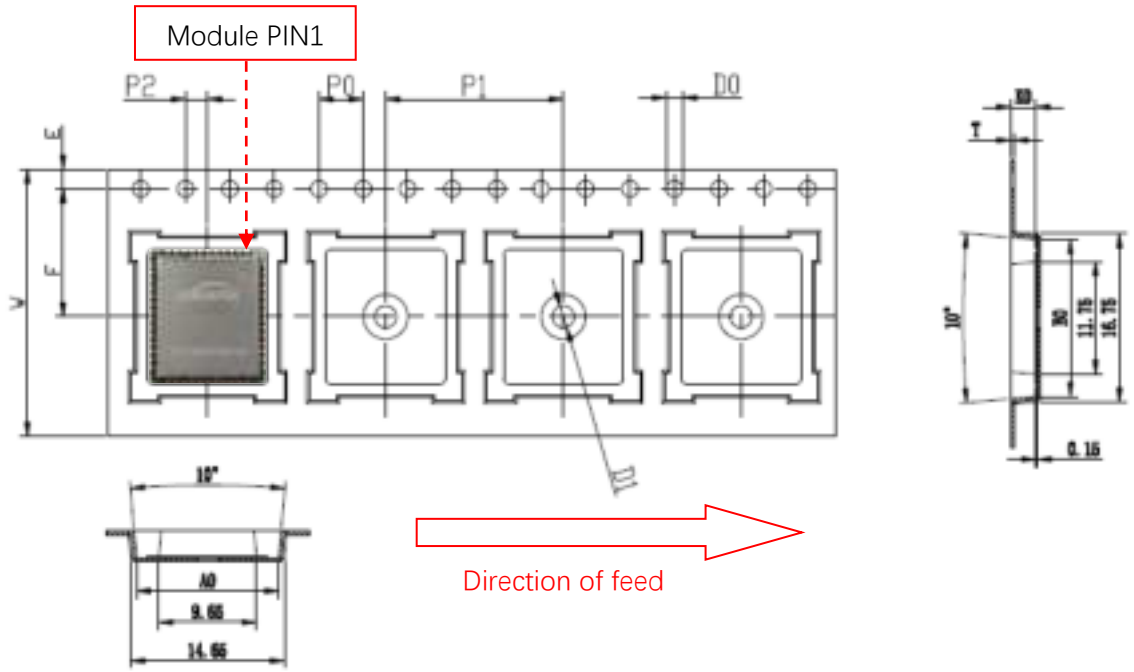
FIG 5 TOP VIEW

FIG 6 TOP VIEW (Remove shielding Case)

FIG 7 BOTTOM VIEW

11 Package Information

Carrier dimension: （Unit : mm）



A0	B0	K0	P0	P1	P2
13.65±0.1	15.75±0.1	2.60±0.1	4.0±0.1	20.0±0.1	2.0±0.1
W	T	E	F	D0	D1
24.0±0.3	0.3±0.05	1.75±0.1	11.50±0.1	$\phi 1.5^{+0.1}_{0}$	$\phi 1.50^{+0.1}_{0}$

FIG 8 Carrier size

Reel dimension： D=38cm 1400PCS Modules Per Reel

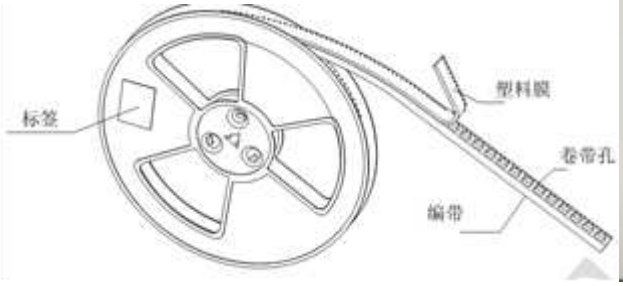


FIG 9 Reel

FIG 10 Reel figure

12 Reference design

12.1 Power supply requirement

The module power supply voltage is DC+3.3V, and the maximum module current is 2000mA. The power supply design needs to consider the output current and power interference. To avoid the +3.3V power supply from interfering with other circuits on the motherboard, it is recommended to supply to the module using the regulator circuit alone. the recommended DC-DC circuit structure shown in the figure below. A 4.7uF~10uF capacitor is connected in parallel at 3_3VD output to filter out the interference. A bead is connected in series at 3_3VD output. The bead and capacitor must be placed as close to the module as possible. If you need to share +3.3V with other circuits, consider whether the current of the shared power supply is sufficient.

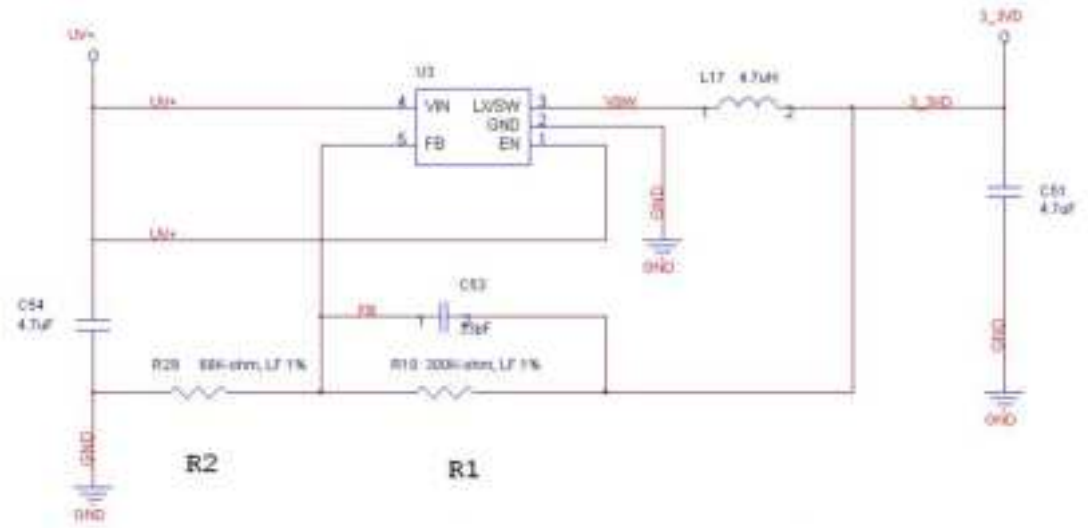


FIG 11 Power supply Circuit schematic

12.2 PCIE Interface

The PCIE interface has 3 differential pairs. The impedance of HSOP/HSON and HSIP /HSIN is 85ohm, The impedance of RFECLK+/RFECLK- is 100ohm, It must be designed as difference line and Surround the data line with ground copper.

12.3 RF circuit

Due to the SMD package, the RF port impedance must be offset after the module is soldered to the motherboard. In order to achieve the best performance, it is recommended to add a PI-type matching network to the motherboard, as shown below (C11, R21,C6). The value of the PI type matching network needs to be debugged according to the actual motherboard to match RF port impedance to 50 Ohm.

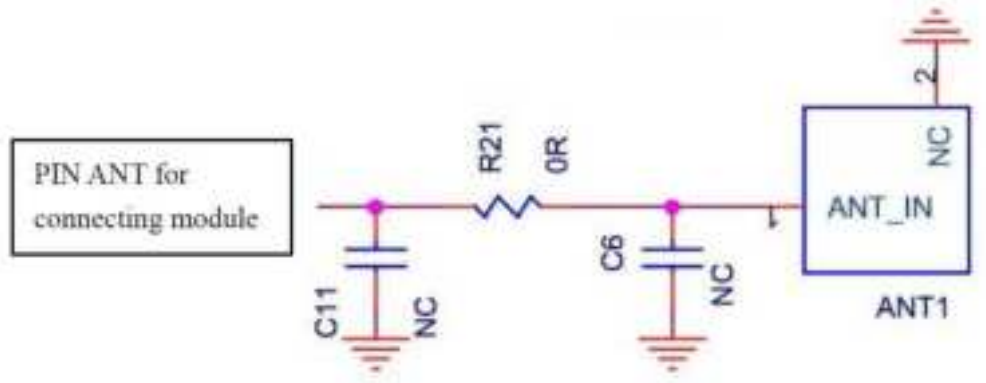


FIG 12 Connect 50 Ohm matching antenna reference circuit

The antenna ANT1 in the figure above must be 50 Ohm. If the antenna is not matched, it is recommended to add a set of PI type matching network at the front of the antenna to match the antenna. Generally, the antenna manufacturers will give Suggestions on matching parameters.

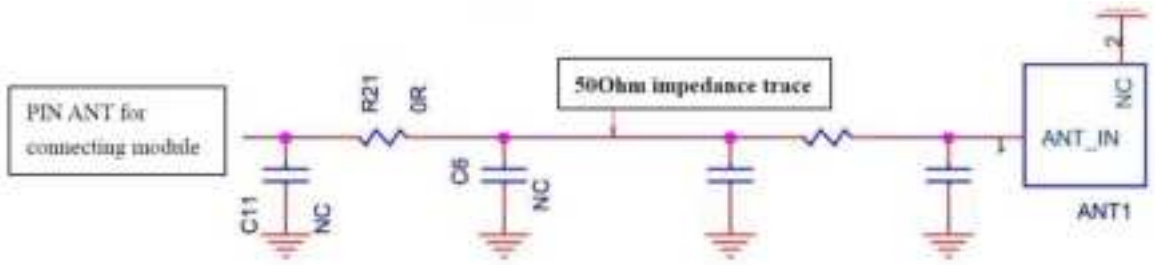


FIG 13 Connect the unmatched antenna reference circuit

The RF line layout should be matched according to 50ohm. The line impedance is related to the plate, plate thickness, line width and copper spacing. Professional software can be used to calculate the line width. Note: for multilayer plates, the plate thickness should calculate the

distance from RF routing layer to GND of the next layer. There are RF lines Layout principles :

1. RF line layout needs to match 50 ohms. The line width can be calculated by professional software. (Note: If it is a multi-layer board, The board thickness should calculate the distance from the RF trace layer to the next ground layer.)

2. The RF line must be surrounded by ground copper and ground holes.

3. The PI-type matching circuit for adjusting the impedance of the module is placed close to the module. The PI type matching circuit for matching the antenna is placed close to the antenna.

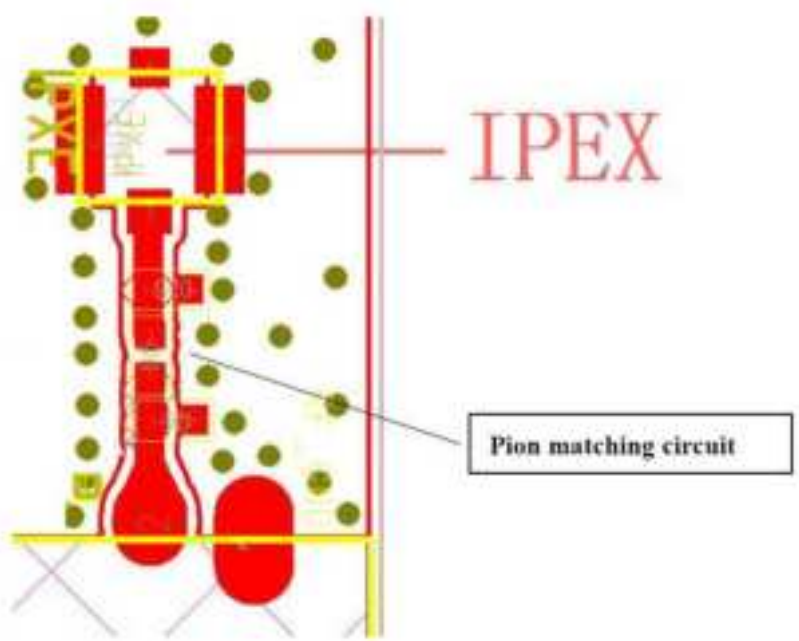


FIG 14 The PI type matching circuit Layout

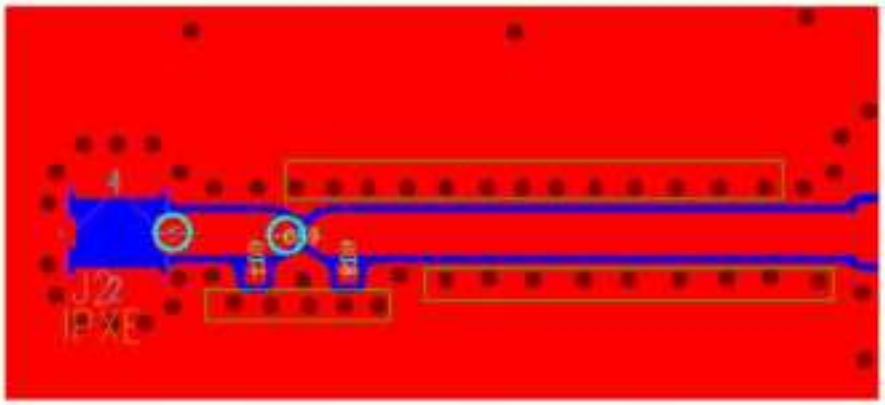


FIG 15 The RF line Layout

12.4 Motherboard interference avoidance

Motherboard interference comes from: high-speed data interface (HDMI), the Operating frequency of main chip, DDR, DC-DC power supply. The method of avoiding interference according to the characteristics of various signals is also different. The main methods of interference avoidance include :

1. keeping away from the source of interference;
2. Adding shields to avoid interference leakage;
3. Reasonable layout to eliminate interference.

12.4.1 Interface interference

When HDMI uses the 74.2MHz frequency, its 33x frequency is in the 2.4G band of Wi-Fi, which will seriously interfere with the Wi-Fi signal. If the HDMI frequency is 148.5MHz, although the 16x frequency is not in the Wi-Fi band, the isolation of the frequency is not good, and the Wi-Fi signal will be interfered to some extent. If the distance between the HDMI interface and the Wi-Fi module on the PCB is less than 5cm, the HDMI output display will interfere with the Wi-Fi signal, resulting in problems such as Wi-Fi connection failure and throughput drop. Therefore, keep the location of the Wi-Fi module away from the HDMI port on the hardware layout to avoid interference.

At the same time, if the Wi-Fi antenna is built-in the motherboard, its placement must also be carefully considered to be far from the interface interference. If the antenna is placed in an incorrect position, even if the module is shielded, the interference signal is coupled through the antenna, which will eventually result in a lower Wi-Fi throughput. (Note: In addition to interference, the placement of the internal antenna should also evaluate the effect of the metal interface, motherboard, and housing material on the antenna impedance.)

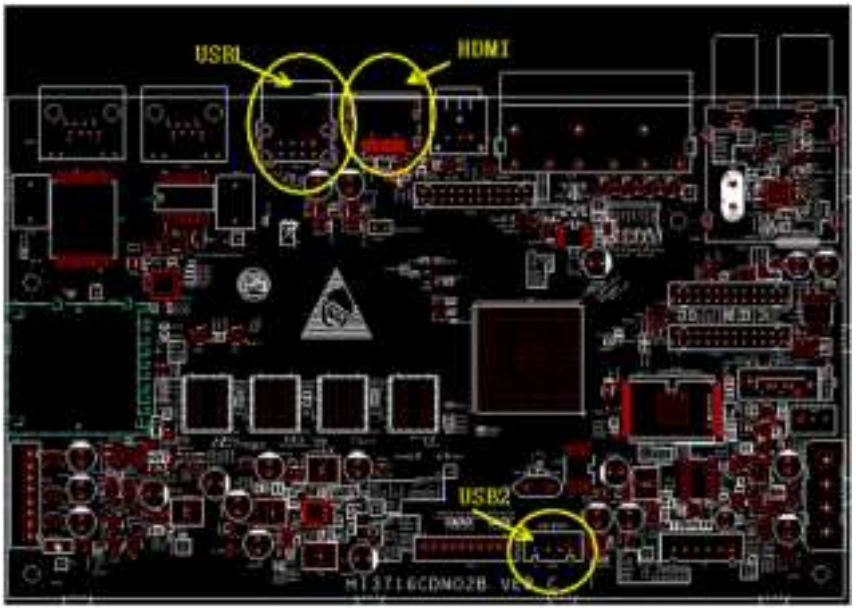


FIG 16 HDIM and USB interference

12.4.2 The main chip interferes with DDR

Because the main chips operate at about 800MHz or DDR2 operate at 667MHz, 3x frequency of 800MHz and 4x frequency of 667MHz are near 2.4GHz band. It must to place Wi-Fi modules and antennas far away from the main chip and DDR. It is strongly recommended that the main chip be isolated from the DDR by a shield. As shown in the figure below.

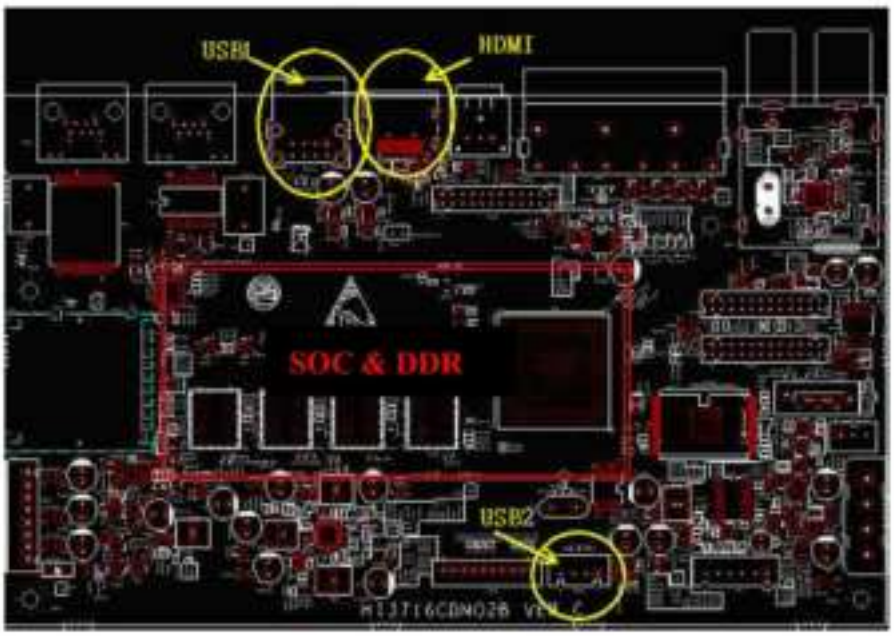


FIG 17 Main chip and DDR interference

12.5 Recommended secondary reflux temperature curve

The number of reflux shall not exceed 2 times, and the tin feeding height of the half hole of the module shall be no less than 1/4.

The lead-free reflux curve requirements of Wi-Fi module products are shown in figure 18 :

Stage	Note	Pb-free assembly
Average ramp-up rate	T_L to Tp	3 ℃/ second max.
Preheat	Temperature min (T_{smin})	150℃
	Temperature max (Tsmax)	200℃
	Time (t_{smin} to t_{smax})	60 – 120 seconds
Time maintained above	Temperature(T_L)	217℃
	Time (t_L)	60 – 150 seconds
Peak package body temperature (Tp)		Tp must not exceed the specified classification temp(Tc=245℃).
Time(tp) within 5℃ of the specified classification temperature (Tc)		30 seconds
Ramp-down rate (Tp to T_L)		6 ℃ / seconds max.
Time 25℃ to peak temperature		8 minutes max.

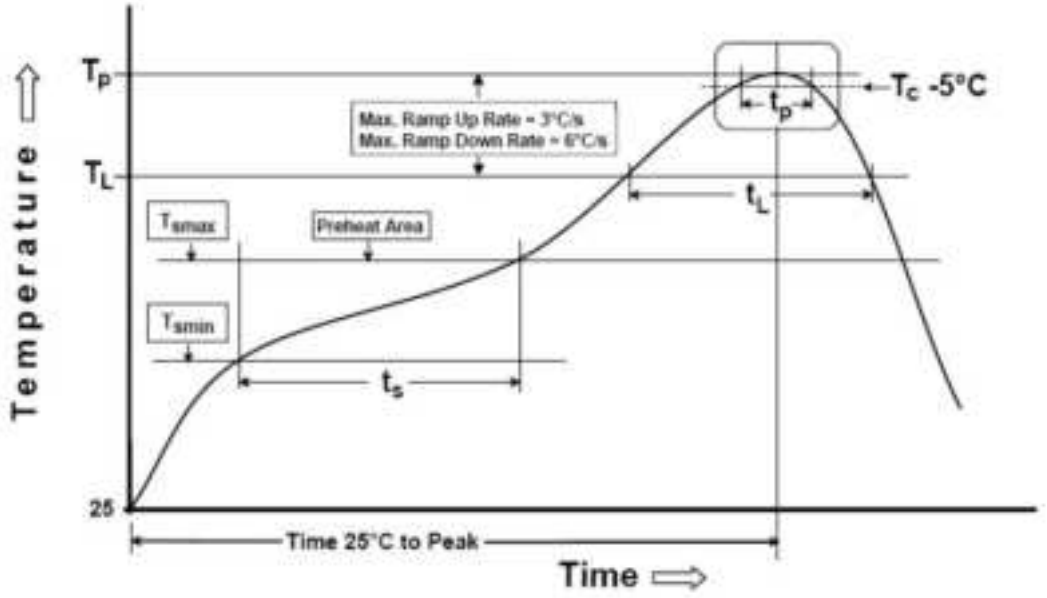


FIG 18 Furnace temperature curve

NOTE:

1.The maximum furnace temperature of the module is 260℃, don’ t exceed this temperature.

2.The gold plating thickness of the module pad is 2u” .

13 Revision History

Revision	Release Date	Summary	Revised By
V1.0	2022-06-28	First release	Xiongbiao Liu

FCC Statement

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

Changes or modifications not expressly approved by the party responsible for compliance could void the user' s authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursua nt to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful inte rference in a residential installation. This equipment generates uses and can radiate radio frequency energy a nd, if not installed and used in accordance with the instructions, may cause harmful interference to radio com munications. 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 turn ing the equipment off and on, the user is encouraged to try to correct the interference by one or more 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 important announcement

Important Note:

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 20cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/Canada.

This device is intended only for OEM integrators under the following conditions:

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,
3. For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change. (if modular only test Channel 1-11)

As long as the three conditions above are met, further transmitter testing 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.

Important Note:

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.

End Product Labeling

The final end product must be labeled in a visible area with the following" Contains

FCC ID: 2AMM6-8852BER3BB"

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.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

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

2.7 Antennas

This radio transmitter **FCC ID:2AMM6-8852BER3BB** has been approved by Federal Communications Commission to operate with the
antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
Bluetooth	/	PCB Antenna	2.0dBi for 2400-2500MHz;	
2.4GWiFi	/	PCB Antenna	2.0dBi for 2400-2500MHz;	
5GWIFI	/	PCB Antenna	2.0dBi for 5000-5900MHz;	

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID:2AMM6-8852BER3BB**".

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.