

A9880 2.4G&5G WiFi6/BT/BLE Module

Low Power Consumption

Product Specification

802.11b/g/n/ax 1T1R WiFi6/BT/BLE Module

(AIC8800M40B)

Version Ver1.0

History

Document Release	Date	Modification	Initials	Approved
Version V1.0	2025/09/15			

Overview

AIC8800M40B is a highly integrated chip with dual band Wi-Fi6, BTDM5.4 for wireless application.

1.1 WiFi Features

- CMOS single-chip fully-integrated RF, Modem and MAC
- Support 2.4GHz/5GHz WiFi6
- Data rates up to 286.8Mbps with 20/40MHz bandwidth
- Support 5MHz/10MHz mode
- RX sensitivity -97dBm in 11b 1M mode
- Tx power up to 23dBm in 11b mode, 18dBm in HT/VHT/HE MCS7 mode
- Support STA, AP, Wi-Fi Direct modes concurrently
- Support STBC, beamforming
- Support WiFi6 TWT
- Support Two NAV, Buffer Report, Spatial reuse, Multi-BSSID, intra-PPDU power save
- Support LDPC
- Support MU-MIMO, OFDMA
- Support DCM, Mid-amble, UORA
- Support WEP/WPA/WPA2/WPA3-SAE Personal, MFP

1.2 BTDM 5.4 Features

- Supports all the mandatory and optional features of Bluetooth 2.1+EDR/3.0/4.x/5.3/5.4
- Supports advanced master and slave topologies

1.3 CPU Features

- Integrated Cortex-M4F CPU with MPU and FPU
- On-chip memory includes 992KB SRAM and 896KB ROM
- Supports SDIO3.0/SPI/USB2.0
- Integrated hardware crypto accelerator AES/HASH
- Integrated True Random Number Generator (TRNG)
- Integrated SPI flash in package, from 8Mbits to 128Mbits flash
- Integrated GPIOs with external level/edge trigger/wakeup
- Integrated UART/I2S/I2C/PWM/SPI/SDMMC

- Integrated 2 channels application 14bits ADC
- Integrated low power timer and watchdog
- Support freeRTOS

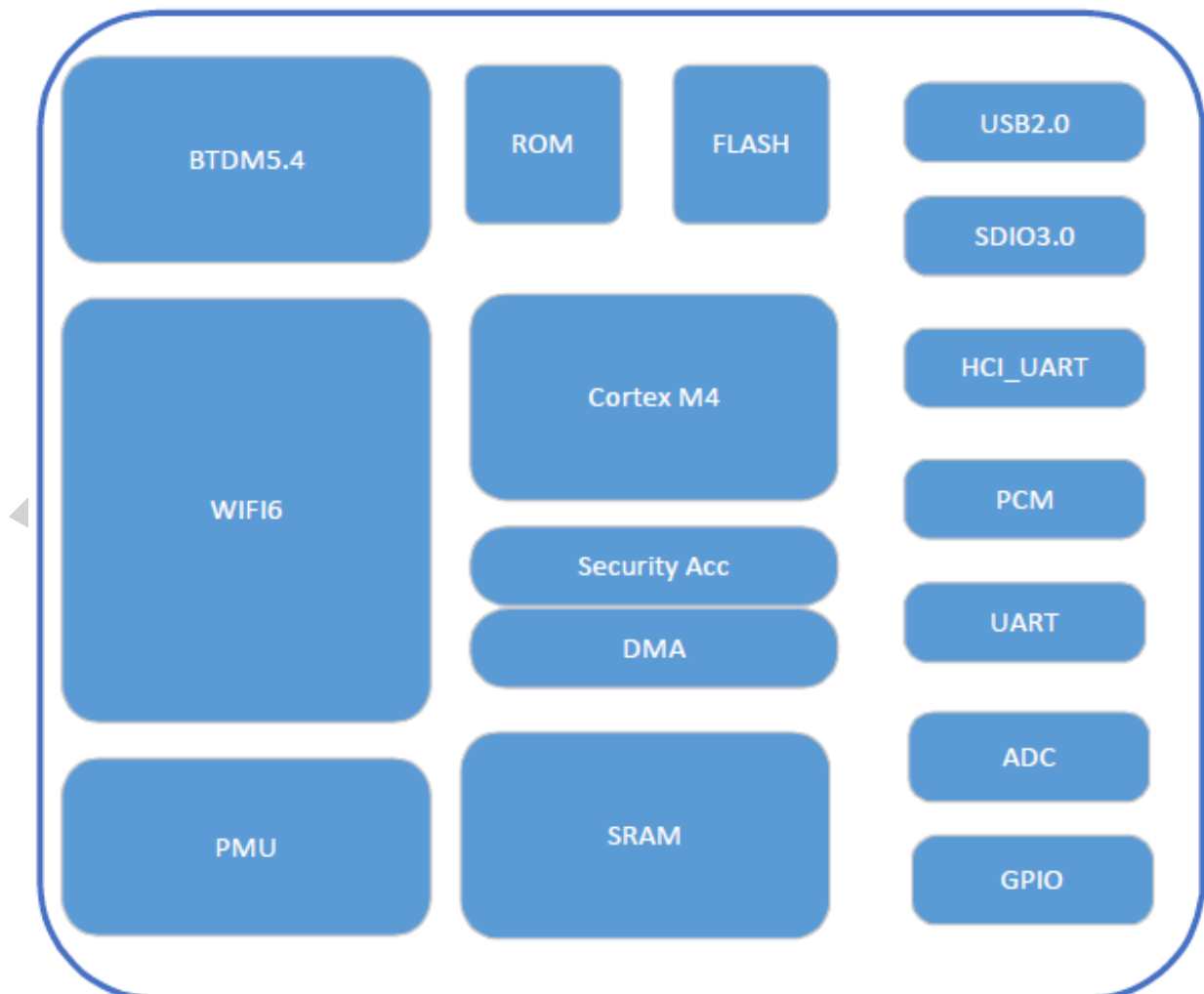
1.4 Other Features

- Supports SDIO3.0/USB2.0/PCIE(D80P)/HCI_UART/PCM interface
- Integrated low power timer and watchdog
- 512 bits eFuse

1.5 Applications

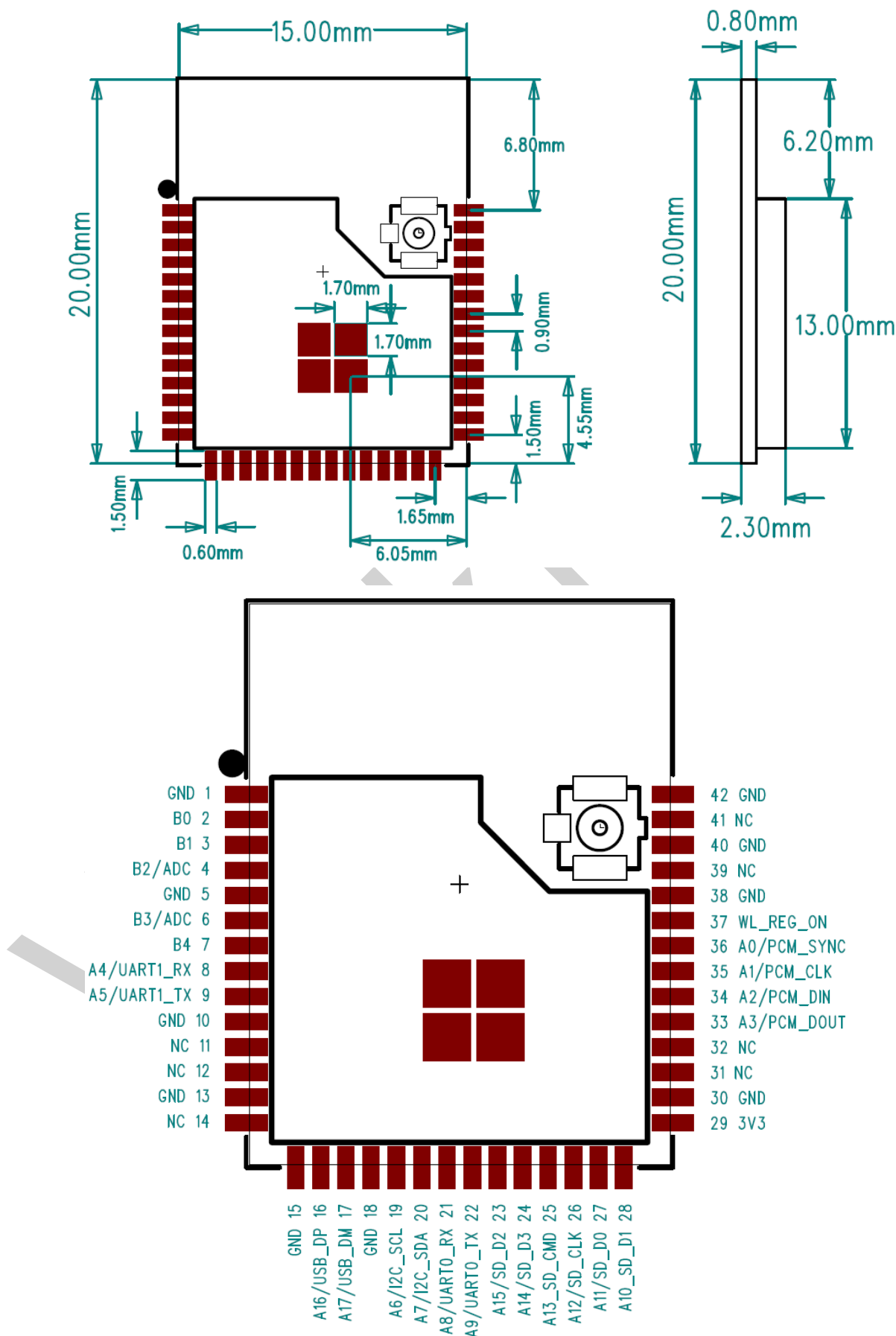
- IoT device
- Wireless device

2 Platform Description



3 Dimensions (Units: mm) (Dimensional tolerance $\pm 10\%$)

Note: The height of the module with a shielding cover is 2.2 ± 0.2 mm, while the overall height of the module without a shielding cover is 1.8 ± 0.2 mm.



There are 4 ground pads at the bottom of the module, which are used to enhance grounding and heat dissipation.

5 Module Pin Definition

A8800M40BSleep wake-up pin: wake-up from falling source: A0:A1,B0,B1. Rising edge wake-up pin: A2~A7,A10~A15;B2~B4.

Pin	Function	Type	Voltage	Description
1	GND	GND	-	GND
2	B0	I/O	VDDIO	B0
3	B1	I/O	VDDIO	B1
4	B2/ADC	I/O	VDDIO	B2/ADC
5	GND	GND	-	GND
6	B3/ADC	I/O	VDDIO	B3/ADC
7	B4	I/O	VDDIO	B4
8	A4/UART1_RX	I/O	VDDIO	A4/UART1_RX
9	A5/UART1_TX	I/O	VDDIO	A5/UART1_TX
10	GND	GND	-	GND
11	NC	NC	-	NC
12	NC	NC	-	NC
13	GND	GND	-	GND
14	NC	NC	-	NC
15	GND	GND	-	GND
16	A16/USB_DP	I/O	VDDIO	A16/USB_DP
17	A17/USB_DM	I/O	VDDIO	A17/USB_DM
18	GND	GND	-	GND
19	A6/I2C_SCL	I/O	VDDIO	A6/I2C_SCL
20	A7/I2C_SDA	I/O	VDDIO	A7/I2C_SDA
21	A8/UART0_RX	I/O	VDDIO	A8/UART0_RX
22	A9/UART0_TX	I/O	VDDIO	A9/UART0_TX
23	A15/SDIO_D2	I/O	VDDIO	A15/SDIO_D2
24	A14/SDIO_D3	I/O	VDDIO	A14/SDIO_D3
25	A13/SDIO_CMD	I/O	VDDIO	A13/SDIO_CMD
26	A12/SDIO_CLK	I/O	VDDIO	A12/SDIO_CLK
27	A11/SDIO_D0	I/O	VDDIO	A11/SDIO_D0
28	A10/SDIO_D1	I/O	VDDIO	A10/SDIO_D1
29	3V3	IPMU	3.3V	3.3V
30	GND	GND	-	GND
31	NC	NC	-	NC
32	NC	NC	-	NC
33	A3/PCM_DOUT	O	VDDIO	A3/PCM_DOUT
34	A2/PCM_DIN	I	VDDIO	A2/PCM_DIN
35	A1/PCM_CLK	I/O	VDDIO	A1/PCM_CLK
36	A0/PCM_SYNC	I/O	VDDIO	A0/PCM_SYNC
37	WL_REG_ON	I	3.3V	WL_REG_ON
38	GND	GND	-	GND
39	NC	NC	-	NC
40	GND	GND	-	GND
41	NC	NC	-	NC
42	GND	GND	-	GND

6 Current consumption Specifications

Pin	Function	Type	Voltage	Description
WiFi TX	2.4G,11b, CCK,1Mbps	21dBm	410	mA
	2.4G,11b, CCK,11Mbps	21dBm	380	mA
	2.4G,11g, OFDM, 6Mbps	21dBm	400	mA
	2.4G,11g, OFDM, 54Mbps	19dBm	320	mA
	2.4G,11n,HT20, MCS0	20dBm	380	mA
	2.4G,11n,HT20, MCS7	18dBm	300	mA
	2.4G,11n,HT40, MCS0	20dBm	360	mA
	2.4G,11n,HT40, MCS7	18dBm	270	mA
	2.4G,11ax,HE20, MCS0	20dBm	370	mA
	2.4G,11ax,HE20, MCS11	16dBm	280	mA
	2.4G,11ax,HE40, MCS0	20dBm	350	mA
	2.4G,11ax,HE40, MCS11	16dBm	270	mA
	5G, 11a, OFDM, 6Mbps	20dBm	530	mA
	5G, 11a, OFDM, 54Mbps	18dBm	350	mA
	5G,11n,HT20, MCS0	20dBm	530	mA
	5G,11n,HT20, MCS7	16dBm	330	mA
	5G,11n,HT40, MCS0	20dBm	460	mA
	5G,11n,HT40, MCS7	16dBm	260	mA
	5G,11ac,VHT20, MCS0	20dBm	500	mA
	5G,11ac,VHT20, MCS8	16dBm	250	mA
	5G,11ac,VHT40, MCS0	20dBm	460	mA
	5G,11ac,VHT40, MCS9	15dBm	230	mA
	5G,11ac,VHT80, MCS0	20dBm	460	mA
	5G,11ac,VHT80, MCS9	15dBm	230	mA
	5G,11ax,HE20, MCS0	20dBm	480	mA
	5G,11ax,HE20, MCS11	14dBm	250	mA
	5G,11ax,HE40, MCS0	20dBm	450	mA
	5G,11ax,HE40, MCS11	14dBm	200	mA
	5G,11ax,HE80, MCS0	20dBm	450	mA
	5G,11ax,HE80, MCS11	14dBm	200	mA
	Stop WiFi TX	-	66	mA
WiFi RX	WiFi RX	-	80	mA
	Stop WiFi RX	-	46	mA
BT TX	BT 1M	6dBm	80	mA
	BT 2M	6dBm	80	mA
	Stop BT TX		38	mA
BT RX	BT RX	-	65	mA
	Stop BT RX	-	38	mA
BLE TX	BLE 1M	6dBm	180	mA
	BLE 2M	6dBm	120	mA
	Stop BLE TX		38	
BLE RX	BLE RX	-	65	mA
	Stop BT RX	-	38	mA

7 RF Characteristics

7.1 WiFi 2.4G WLAN Transmitter Characteristics

Parameter	Test Item	Typical Value	CH1	CH7	CH13	Unit
2.4G Output Power (20M)	11b,CCK, 1Mbps	20±2dBm,EVM<-18dB	21.16	21.42	21.53	dBm
	11b,CCK,11Mbps	20±2dBm,EVM<-15dB	21.25	21.60	21.70	dBm
	11g,OFDM, 6Mbps	20±2dBm,EVM<-12dB	21.18	21.26	21.03	dBm
	11g,OFDM,54Mbps	19±2dBm,EVM<-30dB	18.85	19.01	18.94	dBm
	11n, HT20 MCS0	20±2dBm,EVM<-15dB	20.21	20.43	20.25	dBm
	11n, HT20 MCS7	18±2dBm,EVM<-33dB	17.80	17.97	17.85	dBm
	11ax, HE20 MCS0	20±2dBm,EVM<-15dB	21.03	21.15	20.90	dBm
	11ax, HE20 MCS11	17±2dBm,EVM<-36dB	16.65	16.88	16.82	dBm
Parameter	Test Item	Typical Value	CH3	CH7	CH11	Unit
2.4G Output Power (40M)	11n, HT40 MCS0	20±2dBm,EVM<-12dB	19.95	20.40	20.14	dBm
	11n, HT40 MCS7	18±2dBm,EVM<-33dB	17.50	17.94	17.71	dBm
	11ax, HE40 MCS0	20±2dBm,EVM<-15dB	20.88	21.22	20.85	dBm
	11ax, HE40 MCS11	17±2dBm,EVM<-36dB	16.32	16.89	16.69	dBm

Note: The transmitting power is determined by the settings in the configuration file `aic_userconfig_8800dc` of the driver software. The transmitting power specified in this specification is for reference only.

7.2 WiFi 2.4G WLAN Receiver Characteristic

Parameters	Test Item	CH1	CH7	CH13	Unit
2.4G Receive Sensitivity (20M)	11b, CCK,1M , <-76dBm@8%PER	-98	-98	-98	dBm
	11b,CCK, 11M ,<-76dBm@8%PER	-88	-88	-88	dBm
	11g, OFDM,6M , <-82dBm@10%PER	-93	-93	-93	dBm
	11g, OFDM,54M , <-65dBm@10%PER	-76	-76	-76	dBm
	11n, HT20 MCS0, <-82dBm@10%PER	-93	-93	-93	dBm
	11n, HT20 MCS7, <-64dBm@10%PER	-74	-74	-74	dBm
	11n, HE20 MCS0, <-82dBm@10%PER	-92	-92	-92	dBm
	11n, HE20 MCS11, <-52dBm@10%PER	-64	-64	-64	dBm
Parameters	Test Item	CH3	CH7	CH11	Unit
2.4G Receive Sensitivity (40M)	11n, HT40 MCS0, <-79dBm@10%PER	-90	-90	-90	dBm
	11n, HT40 MCS7, <-61dBm@10%PER	-71	-71	-71	dBm
	11n, HE40 MCS0, <-79dBm@10%PER	-90	-90	-90	dBm
	11n, HE40 MCS11, <-49dBm@10%PER	-60	-60	-60	dBm

7.3 WiFi 5G WLAN Transmitter Characteristics

Parameter	Test Item	Typical Value	CH36	CH100	CH165	Unit
5G Output Power (20M)	11a, OFDM, 6Mbps	19±2dBm, EVM<-20dB	19.82	20.22	19.70	dBm
	11a, OFDM, 54Mbps	18±2dBm, EVM<-30dB	17.56	18.59	18.27	dBm
	11n, HT20 MCS0	18±2dBm, EVM<-25dB	18.72	19.15	18.43	dBm
	11n, HT20 MCS7	16±2dBm, EVM<-32dB	16.56	17.60	17.29	dBm
	11ac, VHT20 MCS0	18±2dBm, EVM<-25dB	18.74	19.19	18.44	dBm
	11ac, VHT20 MCS8	15±2dBm, EVM<-35dB	15.36	16.27	16.00	dBm
	11ax, HE20 MCS0	17±2dBm, EVM<-25dB	18.73	19.23	18.48	dBm
	11ax, HE20 MCS11	13±2dBm, EVM<-36dB	13.27	14.26	14.08	dBm
Parameter	Test Item	Typical Value	CH38	CH110	CH159	Unit
5G Output Power (40M)	11n, HT40 MCS0	18±2dBm, EVM<-25dB	18.73	19.02	18.37	dBm
	11n, HT40 MCS7	16±2dBm, EVM<-32dB	16.65	17.51	17.16	dBm
	11ac, VHT40 MCS0	18±2dBm, EVM<-25dB	18.75	19.04	18.38	dBm
	11ac, VHT40 MCS9	15±2dBm, EVM<-35dB	15.55	16.08	15.85	dBm
	11ax, HE40 MCS0	17±2dBm, EVM<-25dB	18.82	19.12	18.44	dBm
	11ax, HE40 MCS11	13±2dBm, EVM<-36dB	13.42	14.04	13.89	dBm

Note: The transmitting power is determined by the settings in the configuration file `aic_userconfig_8800dc` of the driver software. The transmitting power specified in this specification is for reference only.

7.4 WiFi 5G WLAN Receiver Characteristic

Parameters	Test Item	CH36	CH100	CH165	Unit
5G Receive Sensitivity (20M)	11a, OFDM, 6M, <-82dBm@10%PER	-92	-92	-92	dBm
	11a, OFDM, 54M, <-65dBm@10%PER	-76	-76	-76	dBm
	11n, HT20 MCS0, <-82dBm@10%PER	-92	-92	-92	dBm
	11n, HT20 MCS7, <-64dBm@10%PER	-74	-74	-74	dBm
	11ac, VHT20 MCS0, <-82dBm@10%PER	-92	-92	-92	dBm
	11ac, VHT20 MCS8, <-59dBm@10%PER	-69	-69	-69	dBm
	11ax, HT20 MCS0, <-82dBm@10%PER	-92	-92	-92	dBm
	11ax, HT20 MCS11, <-52dBm@10%PER	-63	-63	-63	dBm
Parameters	Test Item	CH38	CH110	CH159	Unit
5G Receive Sensitivity (40M)	11n, HT40 MCS0, <-79dBm@10%PER	-89	-89	-89	dBm
	11n, HT40 MCS7, <-61dBm@10%PER	-70	-70	-70	dBm
	11ac, VHT40 MCS0, <-79dBm@10%PER	-89	-89	-89	dBm
	11ac, VHT40 MCS9, <-54dBm@10%PER	-63	-63	-63	dBm
	11ax, HT40 MCS0, <-79dBm@10%PER	-89	-89	-89	dBm
	11ax, HT40 MCS11, <-49dBm@10%PER	-60	-60	-60	dBm

7.5 BLE TX Performance

Parameter	Test Item	Typical Value	Channel			Unit
			CH0	CH39	CH78	
Output power	BT 1M bit/s	11±2	12.5	11.9	11.5	dBm
	BT 2M bit/s	8±2	9.4	9.2	9.0	dBm
	BT 3M bit/s	8±2	9.4	9.2	9.1	dBm

7.6 BLE RX Performance

Parameter	Test Item	Typical Value	Channel			Unit
			CH0	CH39	CH78	
Sensitivity 0.1% BER	BT 1M bit/s	<-90	-90	-90	-90	dBm
	BT 2M bit/s	<-90	-90	-90	-90	dBm
	BT 3M bit/s	<-84	-84	-84	-84	dBm

7.7 BLE TX Performance

Parameter	Test Item	Typical Value	Channel			Unit
			CH0	CH19	CH39	
Output power	BLE 1M bit/s	11±2	12.3	11.9	11.5	dBm
	BLE 2M bit/s	11±2	12.6	12.1	11.6	dBm

7.8 BLE RX Performance

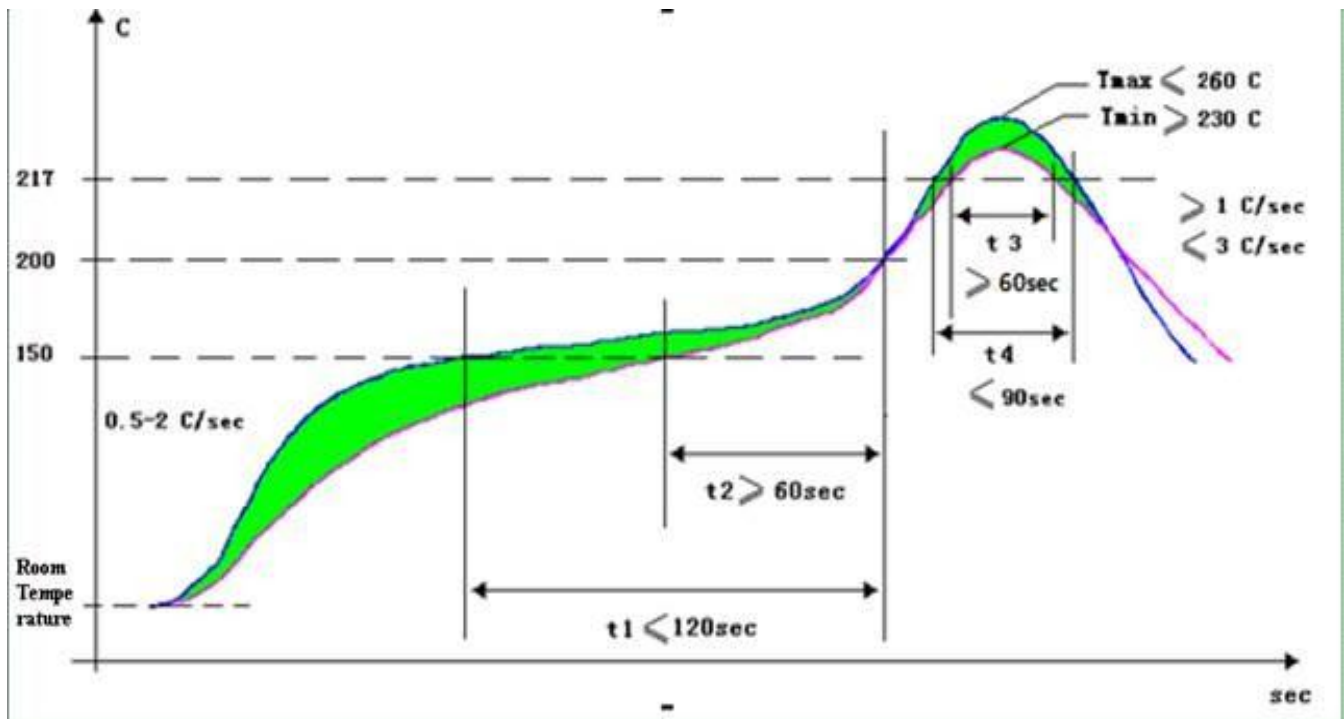
Parameter	Test Item	Typical Value	Channel			Unit
			CH0	CH19	CH39	
Sensitivity 30.8% PER	BLE 1M bit/s	<-92	-92	-92	-92	dBm
	BLE 2M bit/s	<-90	-90	-90	-90	dBm

8 Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
Operation Voltage	3.0	3.3	3.6	V
Operation Current			1000	mA
Operation Temperature	-20		80	°C

9 Parameter Requirements on Lead-Free Reflow Soldering

- shows the thermal profile of lead-free reflow soldering



Parameters of lead-free reflow soldering

Zone	Time	Heating Rate	Peak Temperature	Cooling Rate
Preheat zone(40~150°C)	60~150s	$\leq 2.0\text{C/s}$	-	-
Soak zone(150~200°C)	60~120s	$< 1.0\text{C/s}$	-	-
Reflow zone($>217\text{C}$)	60~90s	-	230-260°C	-
Cooling zone($T_{max} \sim 180\text{C}$)	-	-	-	$1.0\text{C/s} \leq \text{Slope} \leq 4.0\text{C/s}$

Note:

- Preheat zone: The temperature range is 40–150°C (104–302°F), the heating rate must be about 2.0°C/s (36°F/s), and the zone duration must be 60–150s.
- Soak zone: The temperature range is 150–200°C (302–392°F), the heating rate must be less than 1.0°C/s (34°F/s), and the zone duration must be 60–120s. Slow heating is required; otherwise, soldering is poor.
- Reflow zone: The zone temperature increases from 217°C (423°F) to T_{max} and then decreases to 217°C (423°F) again. The zone duration must be 60–90s.
- Cooling zone: The zone temperature decreases from T_{max} to 180°C (356°F). The cooling rate cannot exceed 4.0°C/s (39°F/s).
- It should take no more than 6 minutes for the ambient temperature to increase from 25°C (77°F) to 250°C (482°F).
- The thermal profile shown in the preceding figure provides recommended values. Customers need to adjust the values based on actual production.

- Typically, the duration of the reflow zone is 60–90s. For the boards with great heat capacity, the duration can be prolonged to 120s. For details about the requirements on package thermal resistance, see the IPC/JEDEC J-STD-020D standard. For details about the method of measuring the package temperature, see the JEP 140 standard.

Thermal resistance standard for the lead-free package

Package Thickness	Volume mm3 <350	Volume mm3 350~2000	Volume mm3 >2000
<1.6mm	260℃	260℃	260℃
1.6mm~2.5mm	260℃	250℃	245℃
>2.5mm	250℃	245℃	245℃

The component soldering terminals (such as the solder balls and pins) and external heat sinks are not considered for volume calculation.

The method of measuring the reflow soldering thermal profile is as follows:

According to the JEP140 standard, to measure the package temperature, you are advised to place the temperature probe of the thermocouple close to the chip surface if the chip package is thin, or to drill a hole on the package surface and place the temperature probe of the thermocouple into the hole if the chip

package is thick. The second method is recommended based on the thickness of most chip packages. However, this method is not applicable if the chip package is too thin to drill a hole.

10 Order Information

Module	Part number	Description
A9880	A9880-NI-NS	A9880 , WiFi6/BT/BLE IOT Module , No IPEX , No Shield cover
A9880	A9880-NI-WS	A9880 , WiFi6/BT/BLE IOT Module , No IPEX , With Shield cover
A9880	A9880-WI-NS	A9880 , WiFi6/BT/BLE IOT Module , With IPEX , No Shield cover
A9880	A9880-WI-WS	A9880 , WiFi6/BT/BLE IOT Module , With IPEX , With Shield cover

Federal Communication Commission Statement (FCC, U.S.)

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.

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.

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, a
2. The transmitter module may not be co-located with any other transmitter or antenna
2. For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G ba 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: 2AXX8-A9880"

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 manufactures according to 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C and PART 15 SUBPART E 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

FCC 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 & your body.

2.7 Antennas

This radio transmitter FCC ID: 2AXX8-A9880 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 Model No.	Antenna Gain(Peak)			Antenna Type	Antenna Manufacturers
	BT	2.4G WiFi	5G WiFi		
2.4G & 5G PCB ANT Datasheet	1.23 dBi	1.23 dBi	U-NII-1: 0.31 dBi U-NII-3: 1.03 dBi	PCB Antenna	Shenzhen VlinkTechnologyco,Ltd.

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following " Contains TX FCC ID:2AXX8-A9880".

If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label:

This device complies with Part 15 of 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.

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.

2.11 Note EMI Considerations

Host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional noncompliant limits due to module placement to host components or properties.

2.12 How to make changes

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. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.