

A880S-D40L SDIO/USB WiFi 2.4G/5G/BLE

Product Specification

802.11a/b/g/n/ac/ax WiFi & BLE 5.4 Module 1T1R

(AICSEMI AIC8800D40L)

Version V1.2

History

Document Release	Date	Modification	Initials	Approved
Version V1.2	2025/09/15	First Version		

1 Overview.

AIC8800D40L is a highly integrated chip with dual band WiFi 802.11a/b/g/n/ac/ax, BLE5.4 for wireless application.

1.1 Wi-Fi Features

- CMOS single-chip fully-integrated RF, Modem and MAC
- Support 2.4GHz/5GHz Wi-Fi6
- 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 14dBm in 11b mode, 17dBm in HT/VHT/HE MCS7 mode
- Support STA, AP, Wi-Fi Direct modes concurrently
- Support STBC, beamforming
- Support Wi-Fi6 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 BLE 5.4 Features

- Supports all the mandatory and optional features of Bluetooth low energy 5.4
- Supports advanced master and slave topologies

1.3 Other Features

- Integrated low power timer and watchdog
- 512 bits eFuse

1.4 Applications

- IoT device
- Wireless device

2 Application Diagram

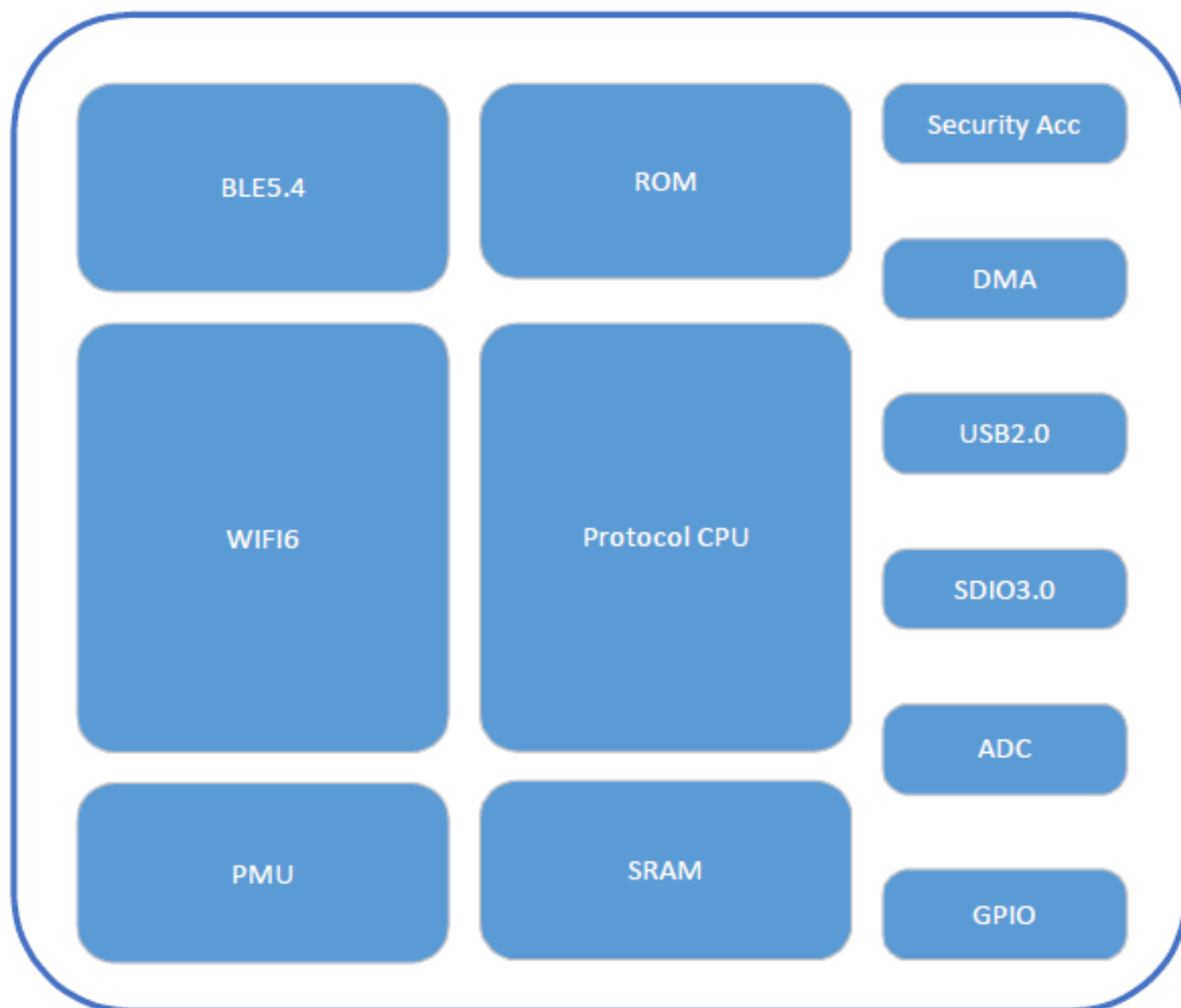


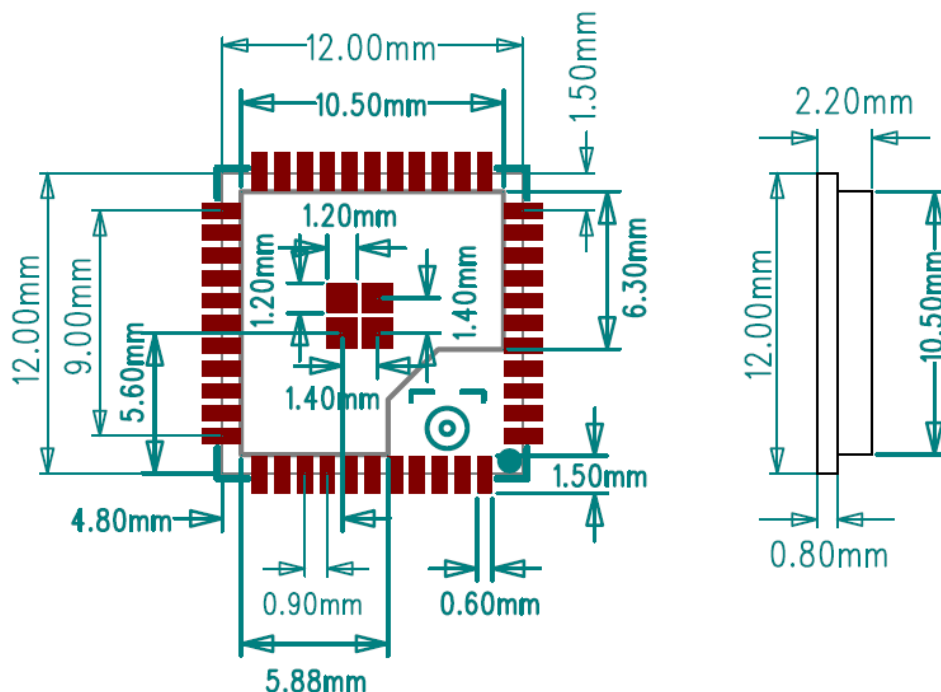
Figure2-1 AIC8800D40L Block Diagram

3 Recommended Operating Conditions

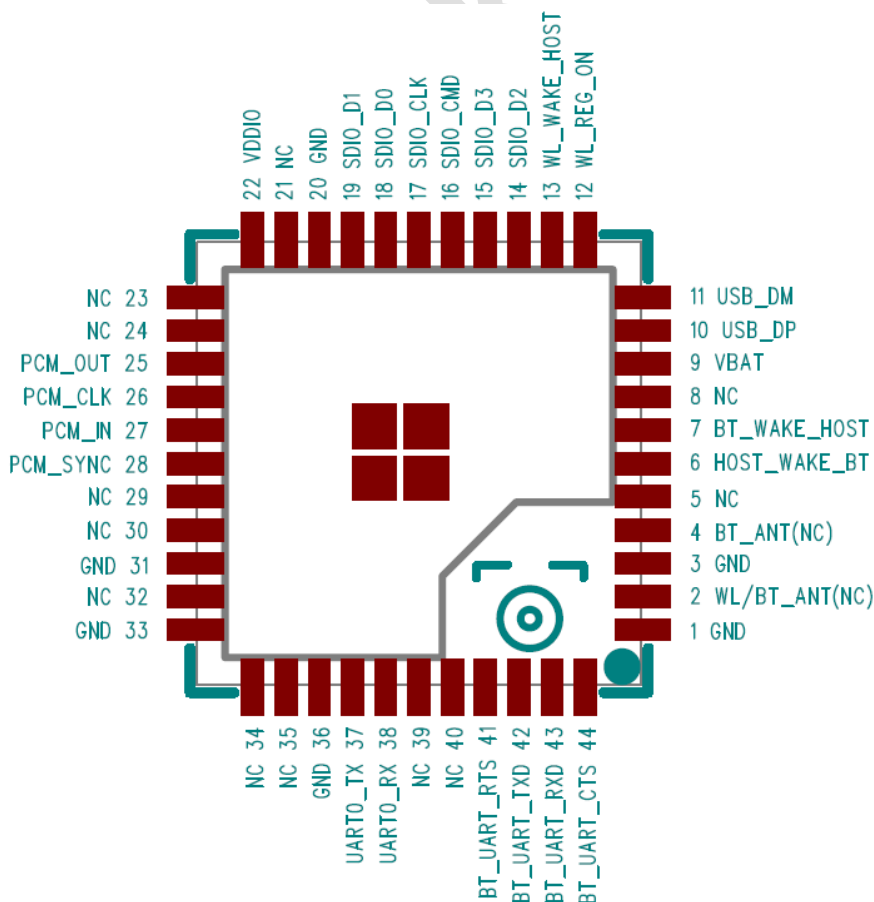
Parameter	Min	Typ	Max	Unit
Operation Voltage	3.0	3.3	3.6	V
Working Current			1000	mA
Operation Temperature	-20		80	°C

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

Note: The height of the module with a shielding cover is $2.2\pm 0.2\text{mm}$, while the overall height of the module without a shielding cover is $1.8\pm 0.2\text{mm}$



5. Pin Definition



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

6 Pin Description

Pin	Function	Type	Voltage	Description
1	GND	GND	-	GND
2	WL/BT_ANT (NC)	ORF	-	WiFi/BLE RF input/output if use IPEX, This Pin NC
3	GND	GND	-	GND
4	BT_ANT (NC)			BT/BLE RF TX/RX Note: The software configuration allows you to choose whether to output BT and WiFi in combination or separately. If configured for combined output, this pin is not connected. If configured for separate output, this pin is connected to the BT antenna.
5	NC			
6	HOST_WAKE_BT	I/O	VDDIO	HOST_WAKE_BT
7	BT_WAKE_HOST	I/O	VDDIO	BT_WAKE_HOST
8	NC			
9	VBAT	IPMU	3.3V	3.3V power Supply
10	USB_DP	I/O	3.3V	USB_DAT+
11	USB_DM	I/O	3.3V	USB_DAT-
12	WL_REG_ON	I	3.3V	WiFi/BT Enable, highly effective.
13	WL_WAKE_HOST	I/O	VDDIO	WL_WAKE_HOST
14	SDIO_D2	I/O	VDDIO	SDIO_D2
15	SDIO_D3	I/O	VDDIO	SDIO_D3
16	SDIO_CMD	I/O	VDDIO	SDIO_CMD
17	SDIO_CLK	I	VDDIO	SDIO_CLK
18	SDIO_D0	I/O	VDDIO	SDIO_D0
19	SDIO_D1	I/O	VDDIO	SDIO_D1
20	GND	GND	-	GND
21	NC			
22	VDDIO	IPMU	VDDIO	IO power, all IO level selection pins, supports 1.8V and 3.3V
23	NC			
24	NC			
25	PCM_OUT	O	VDDIO	PCM_OUT
26	PCM_CLK	I/O	VDDIO	PCM_CLK
27	PCM_IN	I	VDDIO	PCM_IN
28	PCM_SYNC	I/O	VDDIO	PCM_SYNC
29	NC			
30	NC			
31	GND	GND	-	GND
32	NC			
33	GND	GND	-	GND
34	NC			
35	NC			
36	GND	GND	-	GND
37	UART0_TX	O	VDDIO	UART0_TX
38	UART0_RX	I	VDDIO	UART0_RX
39	NC			
40	NC			
41	BT_UART_RTS	O	VDDIO	BT_UART_RTS
42	BT_UART_TXD	O	VDDIO	BT_UART_TXD
43	BT_UART_RXD	I	VDDIO	BT_UART_RXD
44	BT_UART_CTS	I	VDDIO	BT_UART_CTS

Note: Regarding the description of module 12 pins: The PWRKEY of AIC8800 has two pins, namely PWR_WF and PWR_BT, which are in an OR relationship. Pulling up either one can achieve power-on. The chip inside the pin has a 200K pull-down resistor, and a 47K pull-up resistor is recommended. The pin thresholds are as follows:

Table 4-4-1 PWRKEY Threshold

PWRKEY	Level state	Threshold
High	0->1	1.125V
Low	1->0	0.625V

Regarding the WL_REG_ON pin of the 8800 module: It should be noted that the voltage level of this pin does not follow the VDDIO voltage. The PWR_WF pin is connected to a 47K pull-up resistor on the module, which pulls it up to 3.3V. Inside the chip, there is a 200K pull-down resistor, so the voltage of this pin is around 2.67V. If the baseboard does not require reset control for the module, the WL_REG_ON pin of the module can be left floating. Do not connect this pin to a 1.8V pull-up. Otherwise, it may cause abnormal power-on enable issues for the module.

7 Current consumption (Test Setintv 100)

Parameter	Test Item	TX Power	Current	Unit
WiFi TX	2.4G,11b, CCK,1Mbps	21dBm	390	mA
	2.4G,11b, CCK,1Mbps	21dBm	330	mA
	2.4G,11g, OFDM, 6Mbps	21dBm	380	mA
	2.4G,11g, OFDM, 54Mbps	19dBm	300	mA
	2.4G,11n,HT20, MCS0	20dBm	360	mA
	2.4G,11n,HT20, MCS7	18dBm	290	mA
	2.4G,11n,HT40, MCS0	20dBm	330	mA
	2.4G,11n,HT40, MCS7	18dBm	180	mA
	2.4G,11ax,HE20, MCS0	20dBm	320	mA
	2.4G,11ax,HE20, MCS11	16dBm	170	mA
	2.4G,11ax,HE40, MCS0	20dBm	300	mA
	2.4G,11ax,HE40, MCS11	16dBm	170	mA
	5G, 11a, OFDM, 6Mbps	19dBm	530	mA
	5G, 11a, OFDM, 54Mbps	18dBm	350	mA
	5G,11n,HT20, MCS0	18dBm	520	mA
	5G,11n,HT20, MCS7	16dBm	330	mA
	5G,11n,HT40, MCS0	18dBm	460	mA
	5G,11n,HT40, MCS7	16dBm	260	mA
	5G,11ac,VHT20, MCS0	18dBm	500	mA
	5G,11ac,VHT20, MCS8	16dBm	250	mA
WiFi RX	5G,11ac,VHT40, MCS0	18dBm	460	mA
	5G,11ac,VHT40, MCS9	15dBm	230	mA
	5G,11ax,HE20, MCS0	18dBm	480	mA
	5G,11ax,HE20, MCS11	14dBm	250	mA
	5G,11ax,HE40, MCS0	18dBm	450	mA
	5G,11ax,HE40, MCS11	14dBm	200	mA
	Stop WiFi TX	-	66	mA
	WiFi RX	-	80	mA
	Stop WiFi RX	-	46	mA
	BLE TX	BLE 1M	100	mA
BLE RX	Stop BLE TX	-	25	mA
	BLE RX	-	38	mA
	Stop BLE RX	-	23	mA

8 RF Characteristics

8.1 WiFi 2.4G WLAN Transmitter Characteristics

Parameter	Test Item	Typical Value	CH1	CH7	CH13	Unit
Output Power	11b,CCK, 1Mbps	20±2dBm,EVM<-18dB	21.15	21.05	21.07	dBm
	11b,CCK,11Mbps	20±2dBm,EVM<-15dB	21.29	21.14	21.19	dBm
	11g,OFDM, 6Mbps	20±2dBm,EVM<-15dB	21.29	21.14	21.19	dBm
	11g,OFDM,54Mbps	19±2dBm,EVM<-30dB	21.29	20.94	21.07	dBm
	11n, HT20 MCS0	20±2dBm,EVM<-15dB	20.28	20.00	20.21	dBm
	11n, HT20 MCS7	18±2dBm,EVM<-36dB	17.72	17.95	18.16	dBm
	11ax, HE20 MCS0	20±2dBm,EVM<-15dB	21.18	20.81	20.93	dBm
	11ax, HE20 MCS11	16±2dBm,EVM<-36dB	16.60	16.86	17.06	dBm
Parameter	Test Item	Typical Value	CH3	CH7	CH11	Unit
Output Power	11n, HT40 MCS0	20±2dBm,EVM<-15dB	20.01	19.94	20.30	dBm
	11n, HT40 MCS7	18±2dBm,EVM<-34dB	17.49	17.89	18.27	dBm
	11ax, HE40 MCS0	20±2dBm,EVM<-15dB	20.99	20.82	21.06	dBm
	11ax, HE40 MCS11	16±2dBm,EVM<-36dB	16.46	16.82	17.24	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.

8.2 WiFi 2.4G WLAN Receiver Characteristic

Parameters	Test Item	CH1	CH7	CH13	Unit
2.4G Receive Sensitivity	11b, CCK,1M , <-76dBm@8%PER	-96	-96	-96	dBm
	11b,CCK, 11M ,<-76dBm@8%PER	-88	-88	-88	dBm
	11g, OFDM,6M , <-82dBm@10%PER	-92	-92	-92	dBm
	11g, OFDM,54M , <-65dBm@10%PER	-75	-75	-75	dBm
	11n, HT20 MCS0, <-82dBm@10%PER	-92	-92	-92	dBm
	11n, HT20 MCS7, <-64dBm@10%PER	-73	-73	-73	dBm
	11n, HE20 MCS0, <-82dBm@10%PER	-92	-92	-92	dBm
	11n, HE20 MCS11, <-52dBm@10%PER	-63	-63	-63	dBm
Parameters	Test Item	CH3	CH7	CH11	Unit
2.4G Receive Sensitivity	11n, HT40 MCS0, <-79dBm@10%PER	-89	-89	-89	dBm
	11n, HT40 MCS7, <-61dBm@10%PER	-70	-70	-70	dBm
	11n, HE40 MCS0, <-79dBm@10%PER	-90	-90	-90	dBm
	11n, HE40 MCS11, <-49dBm@10%PER	-61	-61	-61	dBm

8.3 WiFi 5G WLAN Transmitter Characteristics

Parameter	Test Item	Typical Value	CH36	CH100	CH165	Unit
5G Output Power	11a, OFDM, 6Mbps	19±2dBm, EVM<-24dB	19.84	19.94	19.67	dBm
	11a, OFDM, 54Mbps	18±2dBm, EVM<-29dB	18.05	17.89	17.90	dBm
	11n, HT20 MCS0	18±2dBm, EVM<-27dB	18.73	18.88	18.52	dBm
	11n, HT20 MCS7	16±2dBm, EVM<-32dB	17.00	16.87	16.94	dBm
	11ac, VHT20 MCS0	18±2dBm, EVM<-28dB	18.76	18.89	18.53	dBm
	11ac, VHT20 MCS8	16±2dBm, EVM<-34dB	16.02	16.13	15.88	dBm
	11ax, HE20 MCS0	18±2dBm, EVM<-27dB	18.76	18.91	18.56	dBm
	11ax, HE20 MCS11	14±2dBm, EVM<-36dB	13.96	14.02	14.05	dBm
Parameter	Test Item	Typical Value	CH38	CH110	CH159	Unit
5G Output Power	11n, HT40 MCS0	18±2dBm, EVM<-26dB	18.86	19.10	18.27	dBm
	11n, HT40 MCS7	16±2dBm, EVM<-31dB	17.19	17.17	16.56	dBm
	11ac, VHT40 MCS0	18±2dBm, EVM<-26dB	18.87	19.14	18.30	dBm
	11ac, VHT40 MCS9	15±2dBm, EVM<-35dB	15.12	15.30	14.64	dBm
	11ax, HE40 MCS0	18±2dBm, EVM<-27dB	18.95	19.20	18.34	dBm
	11ax, HE40 MCS11	14±2dBm, EVM<-36dB	14.07	14.27	13.70	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.

8.4 WiFi 5G WLAN Receiver Characteristic

Parameters	Test Item	CH36	CH100	CH165	Unit
5G Receive Sensitivity	11a, OFDM, 6M, <-82dBm@10%PER	-92	-92	-92	dBm
	11a, OFDM, 54M, <-65dBm@10%PER	-75	-75	-75	dBm
	11n, HT20 MCS0, <-82dBm@10%PER	-92	-92	-92	dBm
	11n, HT20 MCS7, <-64dBm@10%PER	-73	-73	-73	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	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	-59	-59	-59	dBm

8.5 BLE TX Performance

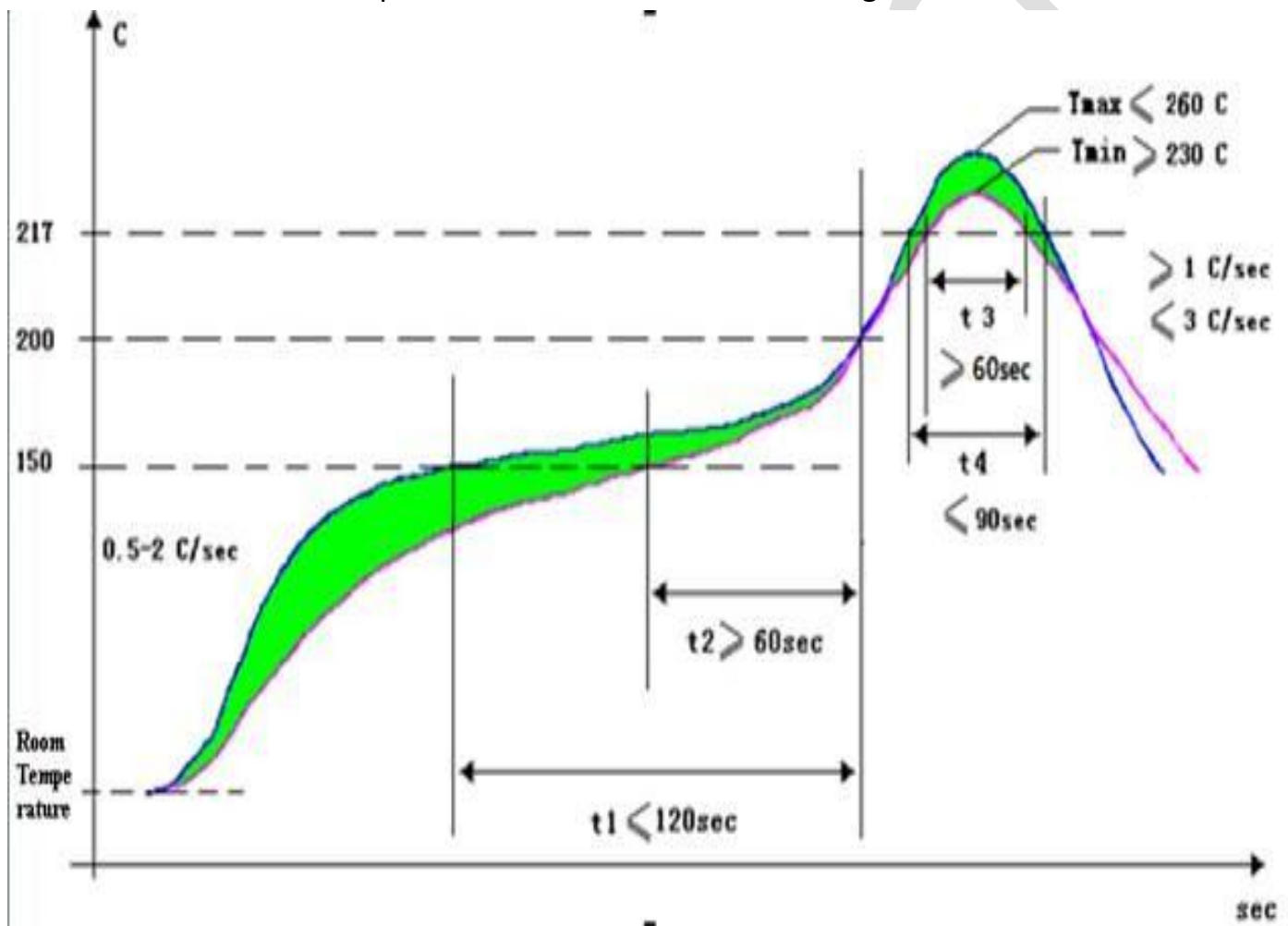
Parameter	Test Item	Typical Value	Channel			Unit
			CH0	CH18	CH38	
Output power	BLE_1M	7±2	7.82	7.76	7.94	dBm
Output power	BLE_2M	7±2	7.80	7.73	7.95	dBm

8.6 BLE RX Performance

Parameter	Test Item	Typical Value	Channel			Unit
			CH0	CH18	CH38	
Sensitivity PER>30%	BLE_1M	<-90	-93	-93	-93	dBm
Sensitivity PER>30%	BLE_2M	<-87	-90	-90	-90	dBm

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℃)	60~150s	≤2.0℃/s	-	-
Soak zone(150~200℃)	60~120s	<1.0℃/s	-	-
Reflow zone(>217℃)	60~90s	-	230~260℃	-
Cooling zone($T_{\text{max}} \sim 180^\circ\text{C}$)	-	-	-	1.0℃/s≤Slope≤4.0℃/s

Note:

- Preheat zone: The temperate 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 mm ³ <350	Volume mm ³ 350~2000	Volume mm ³ >2000
< 1.6mm	260°C	260°C	260°C
1.6mm ~ 2.5mm	260°C	250°C	245°C
> 2.5mm	250°C	245°C	245°C

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
A880S-D40L TSMC Production	A880S-D40L-NI-NS	A880S-D40L (a/b/g/n/ax) WiFi/BLE Module , No IPEX , No Shield cover
	A880S-D40L-NI-WS	A880S-D40L (a/b/g/n/ax) WiFi/BLE Module , No IPEX , With Shield cover
	A880S-D40L-WI-NS	A880S-D40L (a/b/g/n/ax) WiFi/BLE Module , With IPEX , No Shield cover
	A880S-D40L-WI-WS	A880S-D40L (a/b/g/n/ax) WiFi/BLE Module , With IPEX , With Shield cover
A880S-D40L HLMC Production	A880S-D40L-NI-NS-H	A880S-D40L (a/b/g/n/ax) WiFi/BLE Module , No IPEX , No Shield cover
	A880S-D40L-NI-WS-H	A880S-D40L (a/b/g/n/ax) WiFi/BLE Module , No IPEX , With Shield cover
	A880S-D40L-WI-NS-H	A880S-D40L (a/b/g/n/ax) WiFi/BLE Module , With IPEX , No Shield cover
	A880S-D40L-WI-WS-H	A880S-D40L (a/b/g/n/ax) WiFi/BLE Module , With IPEX , With Shield cover