BL-M8800DS2-40

802.11ax 287Mbps WLAN + BT v5.4

SDIO/USB Module Specification

FCC ID:2AL6KBL-M8800DS2-40

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（Top View）

（Bottom View）

Module Name: BL-M8800DS2-40	
Module Type: 802.11a/b/g/n/ac/ax 287Mbps WLAN + Bluetooth v5.4 SDIO/USB Module	
Revision: V1.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
LB-link Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date	Revised By
V0.1	Initial release	2023-10-16	Xhg
V1.0	Official release	2023-11-12	Xhg
V1.0	The level domains of PWR_KEY and PWR_BT are changed from VIO to VDD33, but the version numbers are not changed.	2023-12-05	Xhg

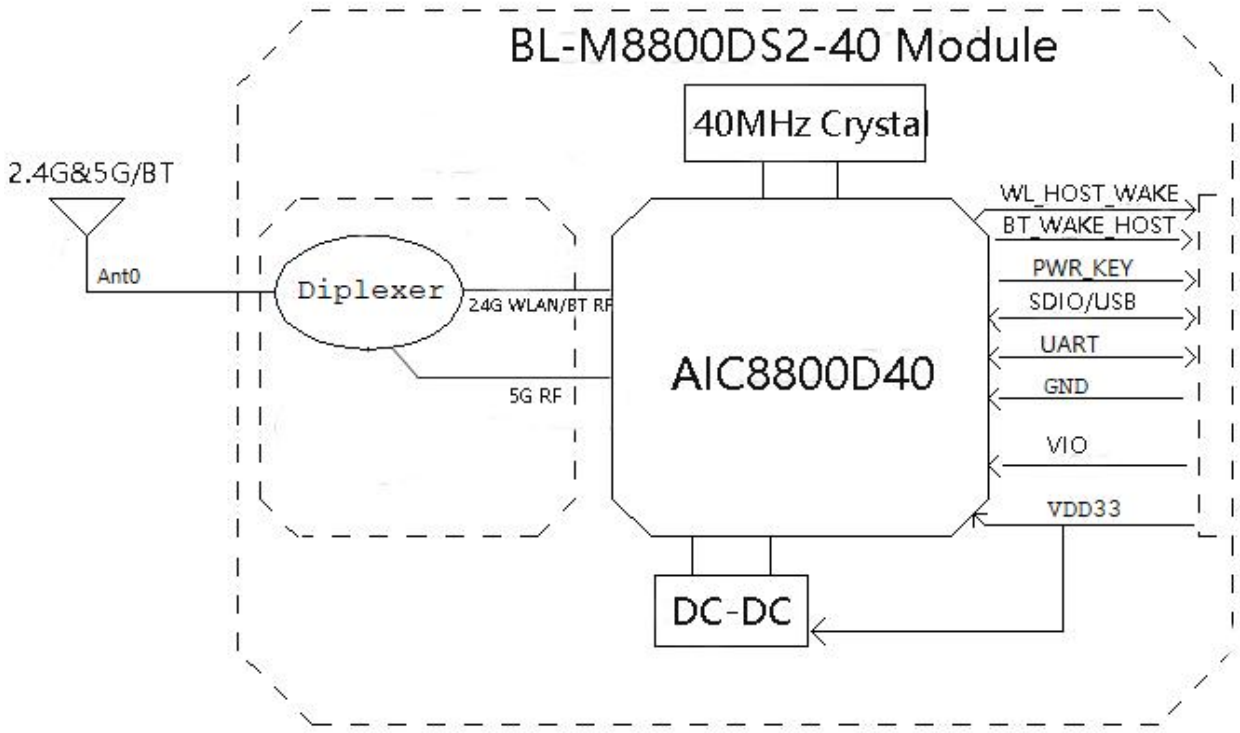
1. Introduction

BL-M8800DS2-40 is a highly integrated Dual-band WLAN+ Bluetooth v5.4 Combo module. It combines a 1T1R Dual-band WLAN subsystem and a Bluetooth v5.4 subsystem. This module compatible IEEE 802.11 a/b/g/n/ac/ax standard and provides the maximum PHY rate up to 287Mbps, it supports BT/BLE dual mode with BT v5.4/v4.2/v2.1 compliant, offering feature-rich wireless connectivity at high standards, and delivering reliable, cost-effective, high throughput from an extended distance.

1.1 Features

- Operating Frequencies: 2.4~2.4835GHz or 5.15~5.85GHz
- Wireless PHY rate can reach up to 287Mbps with 20/40MHz bandwidth
- Host Interfaces are SDIO 3.0 or USB 2.0， the two interfaces are optional and cannot be used together
- Support STA, AP, WLAN Direct modes concurrently
- Support BT Classic / BT Low Energy dual mode

1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M8800DS2-40
Chipset	AIC8800D40
WLAN Standards	IEEE802.11a/b/g/n/ac/ax
BT Specification	Bluetooth Core Specification v5.4/v4.2/v2.1
Host Interface	SDIO for WLAN & UART for Bluetooth or USB for WLAN + Bluetooth
Antenna	Connect to the external antenna through half hole pad
Dimension	12.0*12.0*2.3mm (L*W*H; Tolerance: ±0.3mm_L/W, ±0.2mm_H)
Power Supply	3.3V±0.2V main power supply @600mA (Max) 3.3V±0.2V or 1.8V±0.1V I/O power supply
Operation Temperature	-20℃ to +70℃
Operation Humidity	10% to 95% RH (Non-Condensing)

2. Pin Assignments

(Top view)

2.1 Pin Definition

No	Pin Name	Type	I/O Level	Module Pin Description
1	GND	RF	/	RF Ground connections
2	ANT0	RF	/	RF Pad for 2.4G WLAN/5G WLAN/2.4G BT ANT
3	GND	RF	/	RF Ground connections
4	NC	/	/	NC （Reserved BT_RF PAD for BT ANT）
5	NC	/	/	NC
6	HOST_WAKE_BT	I/O	VIO	1.General Purpose Input / Output Pin GPIOB3 2.Host to wake-up this Bluetooth device input
7	BT_WAKE_HOST	I/O	VIO	1.General Purpose Input / Output Pin GPIOB2 2.Bluetooth device to wake-up Host output
8	NC	/	/	NC
9	VDD33	P	/	3.3V Main power supply
10	USB_DM	A I/O	/	USB 2.0 Device High Speed Interface differential pair
11	USB_DP	A I/O	/	USB 2.0 Device High Speed Interface differential pair
12	PWR_KEY	I	VDD33	enable signal input, it can externally shut down the module by pulled low. When VDD33 and VIO are ready, PWR_KEY goes to high level exceeds 1.1V and lasts for 6mS, the module starts up,then the level of PWR_KEY must be maintained at VIO. (internal pull up to VIO by 47K and pull down to GND by 200K resistors)
13	WL_HOST_WAKE	I/O	VIO	1.General Purpose Input / Output Pin GPIOB2 2.WLAN device to wake-up Host output
14	SD_D2	I/O	VIO	SDIO data line
15	SD_D3	I/O	VIO	SDIO data line
16	SD_CMD	I/O	VIO	SDIO command line
17	SD_CLK	I/O	VIO	SDIO clock line
18	SD_D0	I/O	VIO	SDIO data line
19	SD_D1	I/O	VIO	SDIO data line
20	GND	P	/	Ground connections
21	NC	/	/	NC
22	VIO	P	/	1.8V or 3.3V power supply for digital I/O (USB application is recommended to use 3.3V I/O or 1.8V I/O； SDIO 3.0 application must use 1.8V I/O, otherwise the throughput will not meet the requirements)
23	NC	/	/	NC

24	HOST_WAKE_WL	I/O	VIO	1.General Purpose Input / Output Pin GPIOB0 2. Host to wake-up this WLAN device input
25	PCM_DOUT	O	VIO	1.General Purpose Input / Output Pin GPIOA3 2. PCM serial data signal output
26	PCM_CLK	I/O	VIO	1.General Purpose Input / Output Pin GPIOA1 2. PCM clock signal
27	PCM_DIN	1	VIO	1.General Purpose Input / Output Pin GPIOA2 2. PCM serial data signal input
28	PCM_FSYNC	I/O	VIO	1.General Purpose Input / Output Pin GPIOA0 2. PCM frame sync signal
29	UART0_TX	I	VIO	High-Speed UART Data Out (Debug pin)
30	UART0_RX	O	VIO	High-Speed UART Data In (Debug pin)
31	GND	P	/	Ground connections
32	NC	/	/	NC
33	GND	P	/	Ground connections
34	PWR_BT	I	VDD33	BT system enable. The module has an internal 200K pull-down resistor, Bluetooth is enabled by default, and the PWR_BT pin needs to be connected to GND or NC.
35	NC	/	/	NC
36	GND	P	/	Ground connections
37	NC	/	/	NC
38	NC	/	/	NC
39	NC	/	/	NC
40	NC	/	/	NC
41	UART1_RTS	O	VIO	Bluetooth UART interface RTS
42	UART1_TX	O	VIO	Bluetooth UART interface TX
43	UART1_RX	I	VIO	Bluetooth UART interface RX
44	UART1_CTS	I	VIO	Bluetooth UART interface CTS

P: Power or Ground; I/O: In/Output; I: Input; O :Output; A I/O: Analog In/Output;

AI: Analog Input; AO: Analog Output; RF: Analog RF Port or RF Ground

3. Electrical and Thermal Specifications

3.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-20	25	70	℃
External Antenna VSWR			1.7	2.1	/
Supply Voltage	VDD33	3.1	3.3	3.5	V
	VIO_3.3V	3.1	3.3	3.5	V
	VIO_1.8V	1.7	1.8	1.9	V

3.2 DC Electrical Specification

Symbol	DESCRIPTION	Min	Typ	Max	Units
VIL	CMOS Low Level Input Voltage	0	--	0.3*VIO	V
VIH	CMOS High Level Input Voltage	0.7*VIO	--	VIO	V
VTH	CMOS Threshold Voltage	--	0.5*VIO	--	V

3.3 Current Consumption

Conditions : USB,VDD33=3.3V ,VIO=3.3V; Ta:25℃;			
Use Case	VDD33 Current		
	Typ(I_{RMS})	Max(I_{Peak})	Units
WLAN & BT Unassociated (Linux SDIO Driver)	35	48	mA
2.4G WLAN throughput 180Mbps (Linux SDIO Driver)	130	260	mA
5G WLAN throughput 180Mbps (Linux SDIO Driver)	145	270	mA
2.4G 11b 1Mbps TX@18dBm (TX RF test)	180	242	mA
2.4G 11g 6Mbps TX@18dBm (TX RF test)	170	238	mA
2.4G 11n HT20_MCS0 TX@17dBm (TX RF test)	160	230	mA
2.4G 11ax HE_SU 40M_MCS0 TX@15dBm (TX RF test)	140	180	mA
2.4G 11ax HE_SU 40M_MCS11 TX@13dBm (TX RF test)	110	163	mA

2.4G 11ax HE_SU 40M_MCS11 RX (RX RF test)	37	44	mA
5G 11a 6Mbps TX@17dBm (TX RF test)	220	310	mA
5G 11n HT20_MCS0 TX@17dBm (TX RF test)	212	300	mA
5G 11ax HE_SU 40M_MCS11 TX@12dBm (TX RF test)	170	230	mA
5G 11ax HE_SU 40M_MCS11 RX (RX RF test)	48	64	mA
BT BR_1M TX@6dBm (BT RF test, WLAN disable)	29	36	mA
BT BR_1M RX Active (BT RF test, WLAN disable)	31	30	mA
BT EDR_3M TX@3dBm (BT RF test, WLAN disable)	28	36	mA
BT EDR_3M RX Active (BT RF test, WLAN disable)	35	36	mA
BT LE_1M TX@6dBm (BT RF test, WLAN disable)	29	36	mA

4. WLAN & Bluetooth RF Specifications

4.1 2.4G RF Specification

Conditions : VDD33=3.3V ; Ta:25℃	
Features	**Description**
WLAN Standard	IEEE 802.11b/g/n/ax
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)
Channels	Ch1~Ch13 (For 20MHz Channels)
Modulation	802.11b (DSSS): DBPSK, DQPSK, CCK; 802.11g (OFDM): BPSK, QPSK, 16QAM, 64QAM; 802.11n (OFDM): BPSK, QPSK, 16QAM, 64QAM; 802.11ax (OFDMA): BPSK, BPSK_DCM, QPSK, QPSK_DCM, QAM16, QAM16_DCM, QAM64, QAM256, QAM1024;
Data Rate	802.11b: 1, 2, 5.5, 11Mbps; 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7(1T1R_SISO) 6.5~72.2Mbps; 802.11n (HT40): MCS0~MCS7(1T1R_SISO) 13.5~150Mbps; 802.11ax (HE_MU,OFDMA 26~242RU): MCS0~MCS11(1T1R) 0.4~143.4Mbps; 802.11ax (HE_SU, non-OFDMA 20MHz): MCS0~MCS11(1T1R) 3.6~143.4Mbps; 802.11ax (HE_SU, non-OFDMA 40MHz): MCS0~MCS11(1T1R) 7.3~286.8Mbps;
Frequency Tolerance	≦ ±20ppm

2.4G Transmitter Specifications (TX power tolerance calibrated, customers can define the target TX power within recommended range by modifying configuration file of the driver software, Customers must define the TX power same or lower than recommended Target TX Power as below.)			
TX Rate	Recommended Target TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11b@1Mbps	18	±2	≦-10
802.11b@11Mbps	18	±2	≦-10
802.11g@6Mbps	18	±2	≦-10
802.11g@54Mbps	16	±2	≦-25
802.11n@HT20_MCS0	17	±2	≦-10
802.11n@HT20_MCS7	15	±2	≦-28
802.11n@HT40_MCS0	17	±2	≦-10
802.11n@HT40_MCS7	15	±2	≦-28
802.11ax@HE_SU 40M_MCS0	15	±2	≦-15
802.11ax@HE_SU 40M_MCS11	13	±2	≦-35
2.4G Receiver Specifications			
RX Rate	Min Input Level (Typ. dBm)	Max Input Level (Typ. dBm)	PER
802.11b@1Mbps	-96	-5	< 8%
802.11b@11Mbps	-88	-5	< 8%
802.11g@6Mbps	-92	-5	< 10%
802.11g@54Mbps	-75	-5	< 10%
802.11n@HT20_MCS0	-92	-5	< 10%
802.11n@HT20_MCS7	-73	-5	< 10%
802.11n@HT40_MCS0	-89	-5	< 10%
802.11n@HT40_MCS7	-71	-5	< 10%
802.11ax@HE_SU 40M_MCS0	-88	-5	< 10%
802.11ax@HE_SU 40M_MCS11	-60	-5	< 10%

4.2 5G WLAN RF Specification

Conditions: VDD33=3.3V; Ta:25℃	
Features	Description
WLAN Standard	IEEE 802.11a/n/ac/ax
Frequency Range	5.15~5.25GHz; 5.25~5.35GHz; 5.47~5.73GHz; 5.735~5.835GHz (5GHz ISM Band)

Channels	Ch36, Ch40, Ch44, Ch48; Ch52~Ch64; Ch100~Ch140; Ch149~Ch165(For 20MHz Channels)
Modulation	802.11a (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11n (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11ac (OFDM): BPSK, QPSK, QAM16, QAM64, QAM256; 802.11ax (OFDMA): BPSK, BPSK_DCM, QPSK, QPSK_DCM, QAM16, QAM16_DCM, QAM64, QAM256, QAM1024;
Data Rate	802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7 6.5~72.2Mbps; 802.11n (HT40): MCS0~MCS7 13.5~150Mbps; 802.11ac (VHT20): MCS0~MCS8(1T1R) 6.5~86.7Mbps; 802.11ac (VHT40): MCS0~MCS9(1T1R) 13.5~200Mbps; 802.11ax (HE_MU,OFDMA 26~242RU): MCS0~MCS11(1T1R) 0.4~143.4Mbps; 802.11ax (HE_SU, non-OFDMA 20MHz): MCS0~MCS11(1T1R) 3.6~143.4Mbps; 802.11ax (HE_SU, non-OFDMA 40MHz): MCS0~MCS11(1T1R) 7.3~286.8Mbps;
Frequency Tolerance	≦ ±20ppm

5G Transmitter Specifications (TX power tolerance calibrated, customers can define the target TX power within recommended range by modifying configuration file of the driver software, Customers must define the TX power same or lower than recommended Target TX Power as below.)

TX Rate	Recommended Target TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11a@6Mbps	17	±2	≦-10
802.11a@54Mbps	16	±2	≦-25
802.11n@HT20_MCS0	17	±2	≦-10
802.11n@HT20_MCS7	15	±2	≦-28
802.11n@HT40_MCS0	17	±2	≦-10
802.11n@HT40_MCS7	15	±2	≦-28
802.11ax@HE_SU 40M_MCS0	15	±2	≦-15
802.11ax@HE_SU 40M_MCS11	13	±2	≦-35

5G Receiver Specifications

RX Rate	Min Input Level (Typ. dBm)	Max Input Level (Typ. dBm)	PER

802.11a@6Mbps	-90	-5	< 10%
802.11a@54Mbps	-74	-5	< 10%
802.11n@HT20_MCS0	-90	-5	< 10%
802.11n@HT20_MCS7	-71	-5	< 10%
802.11n@HT40_MCS0	-87	-5	< 10%
802.11n@HT40_MCS7	-68	-5	< 10%
802.11ax@HE_SU 40M_MCS0	-87	-5	< 10%
802.11ax@HE_SU 40M_MCS11	-59	-5	< 10%

4.3 Bluetooth RF Specification

Conditions: VDD33 =3.3V; Ta:25℃			
Features	**Description**		
Bluetooth Specification	Bluetooth Core Specification v5.4/4.2/2.1		
Frequency Range	2.4~2.4835GHz(2.4GHz ISM Band)		
Channels	Bluetooth Classic: Ch0~Ch78 (For 1MHz Channels); Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels);		
Power Classes	Bluetooth Classic: Class1; Bluetooth Low Energy: Class1.5;		
Data Rate & Modulation	BR_1Mbps: GFSK; EDR_2Mbps: π/4-DQPSK; EDR_3Mbps: 8DPSK; LE_125Kbps: GFSK (Coded_S=8); LE_500Kbps: GFSK (Coded_S=2); LE_1Mbps: GFSK (Uncoded); LE_2Mbps: GFSK (Uncoded);		
Bluetooth Transmitter Specifications			
Items	**Min (dBm)**	**Typ (dBm)**	**Max (dBm)**
TX Power			
BR_1M	3	7	11
EDR_2/3M	0	4	8
LE_125/500K	3	7	11
LE_1M	3	7	11

LE_2M	2	6	10
BR_1M (DH1) Modulation Characteristics			
Δf1avg	140KHz	153.5KHz	175KHz
Δf2avg	115KHz	153.2KHz	175KHz
Δf2max	115KHz	165.5KHz	/
Δf2avg/Δf1avg	0.8	1	/
BR_1M (DH1) Initial Carrier Frequency Tolerance			
Init Freq Error	-75kHz	-4.3kHz	+75kHz
EDR_3M(3DH5) EDR Carrier Frequency Stability and Modulation Accuracy			
ωi	-75KHz	-5.3KHz	+75KHz
ωi+ωo	-75KHz	-5.4KHz	+75KHz
ωo	-10KHz	0.8KHz	+10KHz
8DPSK RMS DEVM	/	0.06	0.13
8DPSK Peak DEVM	/	0.12	0.25
LE_1M Modulation Characteristics			
Δf1avg	225KHz	250.7KHz	275KHz
Δf2avg	185KHz	252.9KHz	275KHz
Δf2max	185KHz	245.5KHz	/
Δf2avg/Δf1avg	0.8	0.98	/
LE_2M Modulation Characteristics			
Δf1avg	450KHz	494KHz	550KHz
Δf2avg	370KHz	504KHz	550KHz
Δf2max	370KHz	529KHz	/
Δf2avg/Δf1avg	0.8	1.1	/

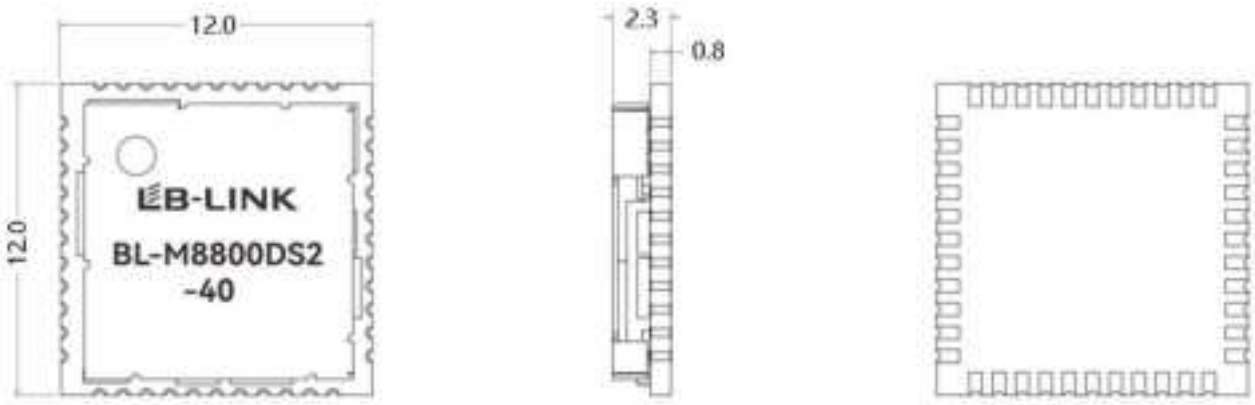
Bluetooth Receiver Specifications

Items	Sensitivity		Maximum Input Level	
	Input Level (Typ. dBm)	BER	Input Level (Typ. dBm)	BER
BR_1M	-90	≦0.1%	-5	≦0.1%
EDR_3M	-80	≦0.01%	-5	≦0.1%

	Input Level (Typ. dBm)	PER	Input Level (Typ. dBm)	PER
LE_125/500K	-90	≦5%	-5	≦5%
LE_1M	-88	≦5%	-5	≦5%
LE_2M	-84	≦5%	-5	≦5%

5. Mechanical Specifications

5.1 Module Outline Drawing

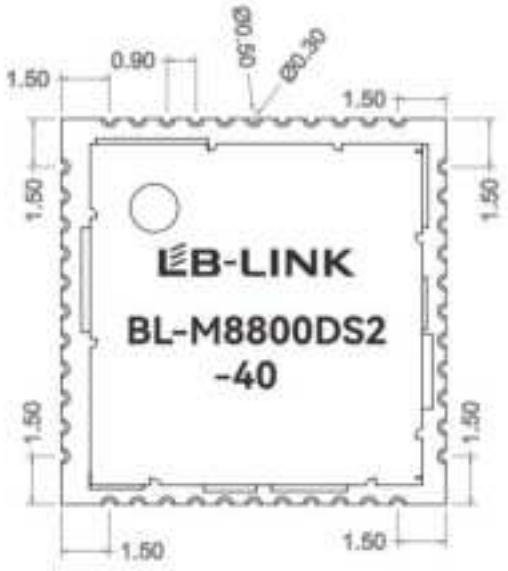


(Top View) (Side View) (Bottom View)

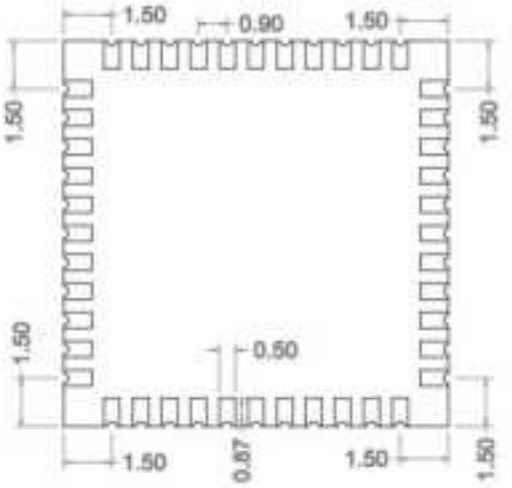
Module dimension: 12.0*12.0*2.3mm (L*W*H; Tolerance: ±0.3mm_L/W, ±0.2mm_H)

Module Bow and Twist: ≤0.1mm

5.2 Mechanical Dimensions



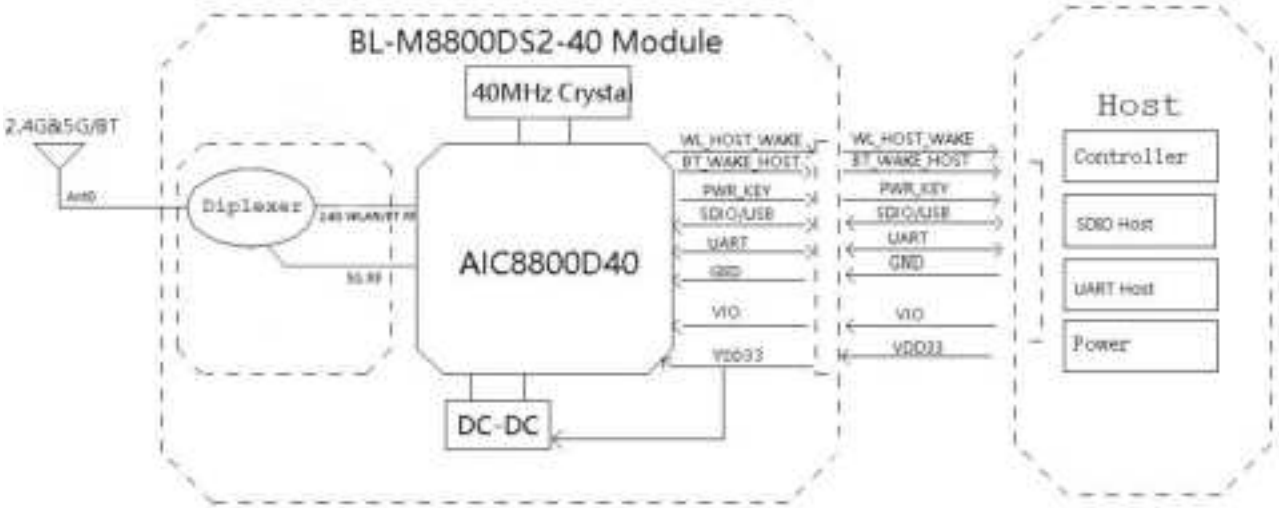
(Top View)



(Bottom View)

6. Application Information

6.1 Typical Application Circuit



6.2 HW Application Note

a. RF path needs to maintain 50 ohm impedance.

b. The module UART_TX is connected to the RX of the master circuit, and the UART_RX is connected to the TX of the master circuit.

c. Keep the SDIO lines as equal as possible and minimize the distance between the host and the module. Make sure SD_CLK has a good ground reference.

d. Main power supply voltage: DC 3.1 ~ 3.5V, ripple voltage <80mV

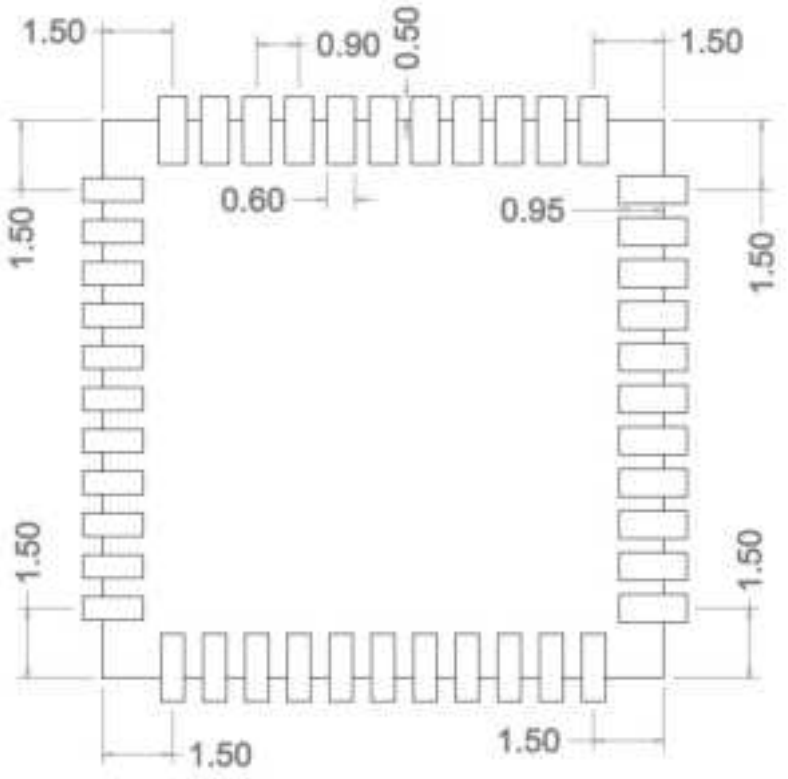
e. Maximum RMS current ≥400mA and maximum peak current ≥600mA

f. For fast transient response, a current mode buck converter is recommended.

g. The USB high speed differential pair should be maintain 90Ω ±5Ω differential impedance.

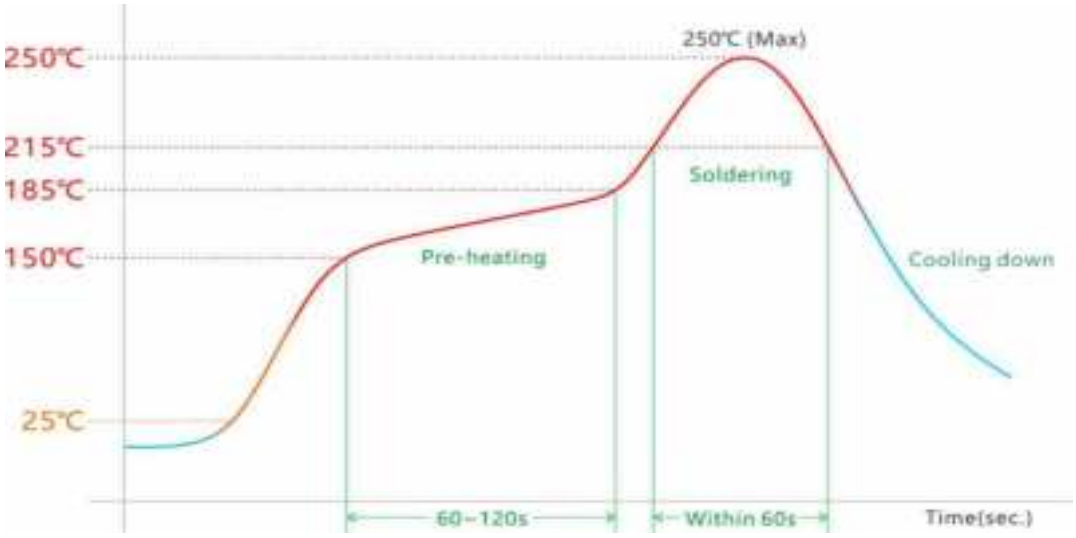
h. USB signal pairs as short as possible, avoid interference from Power and other signals.

6.3 Recommend PCB Layout Footprint



(Design Unit: mm)

6.4 Reflow Soldering Standard Conditions



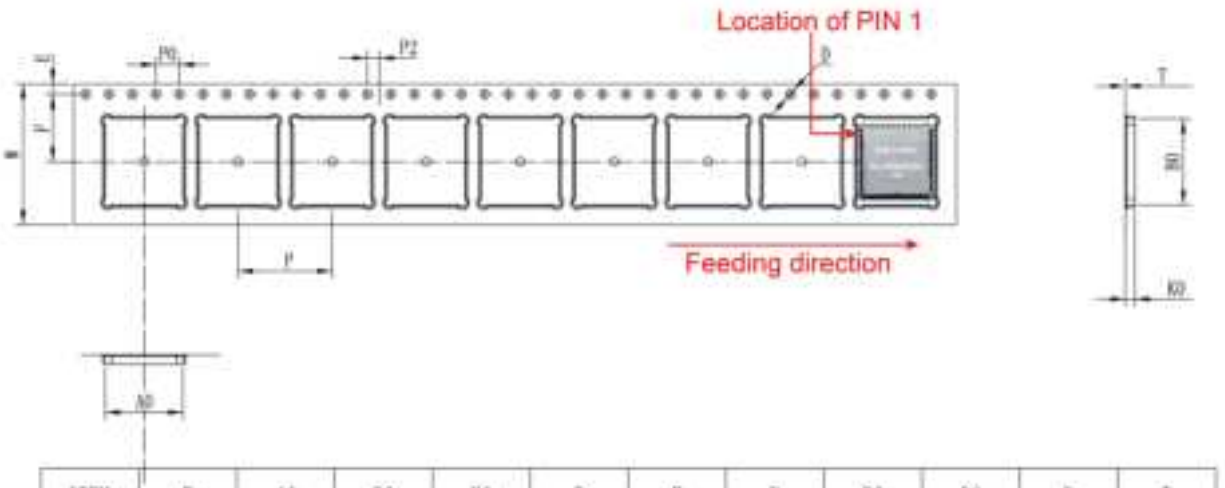
Please use the reflow within 2 times.
Set up the highest temperature within 250℃.

7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	AIC8800D40	AIC Semiconductor (Shanghai) CO.,LTD	
2	PCB	BL-M8800DS2	SHEN ZHEN QILI ELECTRON CO.,LTD	
			Quzhou Sunlord Electronics Co.,Ltd	
			ShenZhen Tie Fa Technology Limited	
3	Crystal	40MHz-2016	LUCKI CM ELECTRONICS CO.,LTD	
			Chengde oscillator Electronic Technology CO.,LTD	
			JinHua East Crystal Electronic CO.,LTD	
			HUBEI TKD CRYSTAL ELECTRONIC SCIENCE AND TECHNOLOGY CO.,LTD	
4	Diplexer	DIP1608	Shenzhen Sunlord Electronics Co.,Ltd	
			Dongguan Hekang Electronics Co.,LTD	
			Shenzhen FTR Technologies CO., LTD	
			Walsin Technology Corporation	

8. Package and Storage Information

8.1 Package Dimensions



ITEM	W	A0	B0	K0	E	F	P	P0	P2	D	T
DIM	24.00-0.3	12.40±0.1	12.40±0.1	2.90±0.1	1.75±0.1	11.5±0.1	20.00±0.1	4.00±0.1	2.00±0.1	Φ1.5±0.1	0.30±0.05

Package specification:

1. 1,000 modules per roll and 5,000 modules per box.
2. Outer box size: 37.5*36*29cm.
3. The diameter of the blue environment-friendly rubber plate is 13 inches, with a total thickness of 28mm (with a width of 24mm carrying belt).
4. Put 1 package of dry agent (20g) and 1 humidity card in each anti-static vacuum bag.
5. Each carton is packed with 5 boxes.

8.2 Storage Conditions

Absolute Maximum Ratings:
Storage temperature: -40℃ to +85℃
Storage humidity: 10% to 95% RH（Non-Condensing）
Recommended Storage Conditions:
Storage temperature: 5℃ to +40℃
Storage humidity: 20% to 90% RH

Please use this Module within 12month after vacuum-packaged.
The Module shall be stored without opening the packing.
After the packing opened, the Module shall be used within 72hours.
When the color of the humidity indicator in the packing changed,
the Module shall be baked before soldering.
Baking condition: 60℃, 24hours, 1time.

ESD Sensitivity：
ESD Protection: 2KV(HBM, Maximum rating)
The Module is a static-sensitive electronic device.
Do not operate or store near strong electrostatic fields.
Take proper ESD precautions!

ESD CAUTION

9 FCC Statement

Note: 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 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.

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.

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

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.

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,For all products market in Us, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band

3. by supplied firmware programming tool. OEM shall not supply any tool or info to the end-userregarding 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-locationwith another transmitter), then the fCC authorization is no longer considered valid and the fCc iD cannot beused on the final product. in these circumstances, the OEM integrator will be responsible for re-evaluating theend product (including the transmitter) and obtaining a separate fCC authorization.

Labeling

If the product is sold separately in the United States, product must be labeled in a visible area with the following

FCC ID:2AL6KBL-M8800DS2-40.

If it is used in other products and meets FCC regulations, The final end product must be labeled in a visible area with the following " Contains FCC ID: 2AL6KBL-M8800DS2-40"

10 Integration instructions for host product manufacturers according to KDB 996369 DO3 OEM Manual V01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C, 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 transmiting condition or differentoperational condiions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturerfor the installation method in end system.

This module can only be used as client , and the host manufacturers can not modify information. Because the The software has encryption and the hardware is fixed. The encryption key is known by the module manufacturer only. The correct firmware is verified and installed by the module manufacturer.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

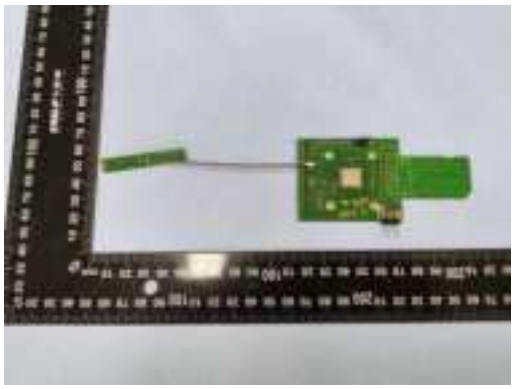
Not applicable

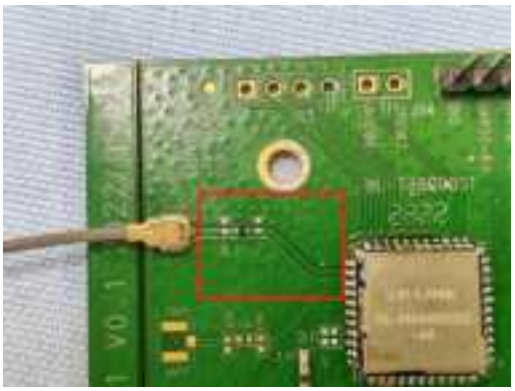
2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontroled enyironment. This equioment should beinstalled and operated with minimum distance 20cm between the radiator & your body.

2.7 antenna:

This product has a fixed antenna, the antenna connection details are shown in the figure below.





Remark: The addition of any component will affect the result of the launch.

If have a gain greater than the maximum gain indicated are strictly prohibited for use with this device.

Antenna types and antenna gains are shown in the table below:

Frquency(MHz)	Antenna type	Antenna gain	Remark
2400-2500	External antenna	2.52dBi	
5000-6000	External antenna	2.51dBi	

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains FCC ID:2AL6KBL-M8800DS2-40"

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to conirm compliance with FCC requirements for the transmiter when the module isinstalled in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

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

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 orremove 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.