BL-M8723DS1

IEEE 802.11b/g/n 150Mbps 1T1R SDIO WiFi and BT combo Module

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Module Name: BL-M8723DS1	
Module Type: 802.11b/g/n 150Mbps 1T1R SDIO WiFi and BT combo Module	
Revision: V1.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
BL-link Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date
1.0	Official release	2020-07-03

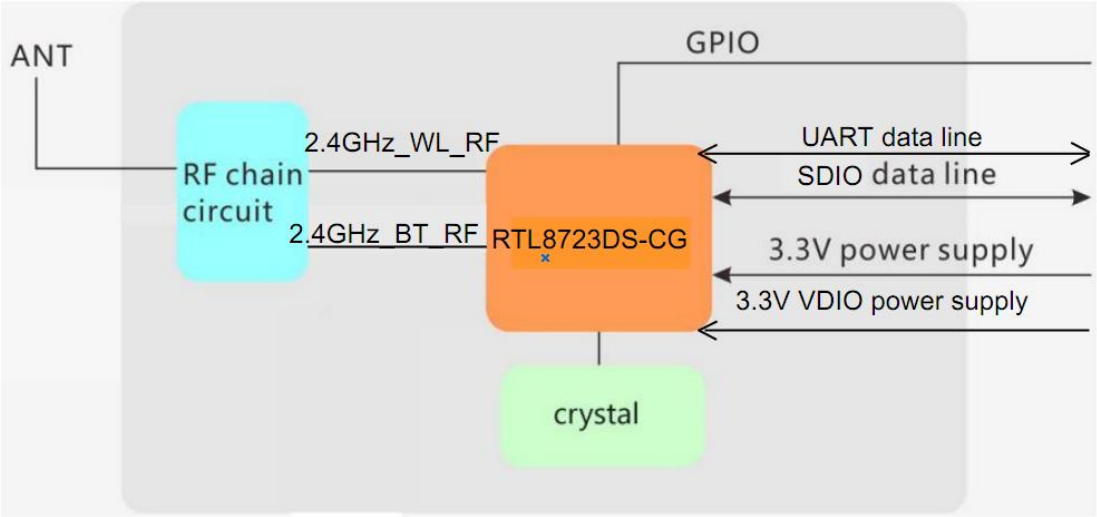
1. Introduction

BL-M8723DS1 is a highly integrated WiFi+BT combo module, it contains a WLAN and a BT MAC, a 1T1R capable base band. It supports IEEE 802.11b/g/n standard and provides the highest PHY rate up to 150Mbps, and Bluetooth can support BT2.1+EDR/BT3.0 and BT4.2. This module can offering feature-rich wireless connectivity and reliable throughput from an extended distance.

1.1 Features

- Operating Frequencies: 2.4~2.4835GHz
- Host Interface is SDIO 2.0 and UART
- IEEE Standards: IEEE 802.11b/g/n
- BT2.1+EDR/BT3.0 and BT LE4.2
- Wireless data rate can reach up to 150Mbps
- Connect to external antenna through half hole pad
- Power Supply: 3.3±0.2V main power and VDIO power supply

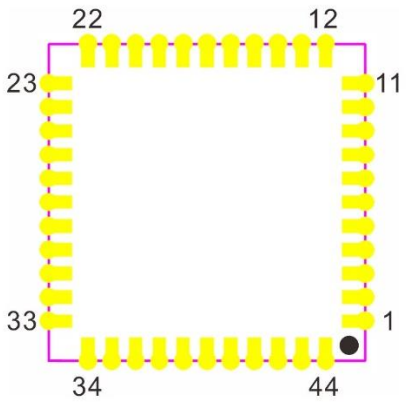
1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M8723DS1 WiFi and BT combo Module
Chipset	RTL8723DS-CG
WiFi Standards	IEEE802.11b/g/n/, 1T1R, 2.4GHz, 150Mbps (Max)
BT Standards	BT 4.2/4.2LE/2.1EDR/2.1BR
Host Interface	SDIO 2.0 for WIFI; UART for BT
Antenna	Connect to the external antennas through half hole pad
Dimension	SMD 44Pins, 12*12*1.6mm (L*W*H)
Power Supply	DC 3.3±0.2V(main power and VDIO power) @ 350 mA (Max)
Operation Temperature	-10℃ to +70℃
Storage temperature	-45℃ to +85℃
Operation Humidity	10% to 95% RH (Non-Condensing)

2. Pin Assignments



Top view

2.1 Pin Definition

No	Pin Name	Type	Description	Supply
1	GND	RF	Ground connections	
2	WLAN/BT ANT	RF	WLAN and BT RF port	
3	GND	RF	Ground connections	

4	NC	/	NC	
5	NC	/	NC	
6	BT_WAKE	I	HOST wake-up Bluetooth device	VDIO
7	BT_WAKE_HOST	O	Bluetooth device to wake-up HOST	VDIO
8	NC	/	NC	
9	VDD33	P	3.3V Main power supply	
10	NC	/	NC	
11	NC	/	NC	
12	WL_DSI#	I	WLAN radio off (active low)	VDD33
13	WL_WAKE_HOST	O	WLAN to wake-up HOST	VDIO
14	SD_D2	I/O	SDIO data line	
15	SD_D3	I/O	SDIO data line	
16	SD_CMD	I/O	SDIO command line	
17	SD_CLK	I	SDIO clock line	
18	SD_D0	I/O	SDIO data line	
19	SD_D1	I/O	SDIO data line	
20	GND	P	Ground connections	
21	NC	/	NC	
22	VDIO	P	3.3V SDIO power supply	
23	NC	/	NC	
24	SUSCLK_IN	I	Shared with GPIO6. External 32K or RTC clock input with 1.8V ~ 3.3V swing. This clock source is configured by BT and WL FW, respectively.	
25	PCM_DOUT	O	PCM Data output	
26	PCM_CLK	I/O	PCM Clock	
27	PCM_DIN	I	PCM data input	
28	PCM_SYNC	O	PCM sync signal	
29	NC	/	NC	
30	NC	/	NC	
31	GND	P	Ground connections	
32	NC	/	NC	
33	GND	P	Ground connections	
34	BT_DIS#	I	Shut down BT function (active low)	VDD33
35	NC	/	NC	
36	GND	P	Ground connections	

37	NC	/	NC	
38	NC	/	NC	
39	NC	/	NC	
40	NC	/	NC	
41	GND	P	Ground connections	
42	UART_OUT	O	HOST Data output	
43	UART_IN	I	HOST Data input	
44	UART_CTS	I	HOST_CTS	

P: Power, I: Input, O: Output, I/O: In/Output, RF: Analog RF Port

3. Electrical and Thermal Specifications

3.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-10	25	70	℃
External Antenna VSWR		1	1.7	2	/
Supply Voltage	VDD33/VDIO	3.1	3.3	3.5	V

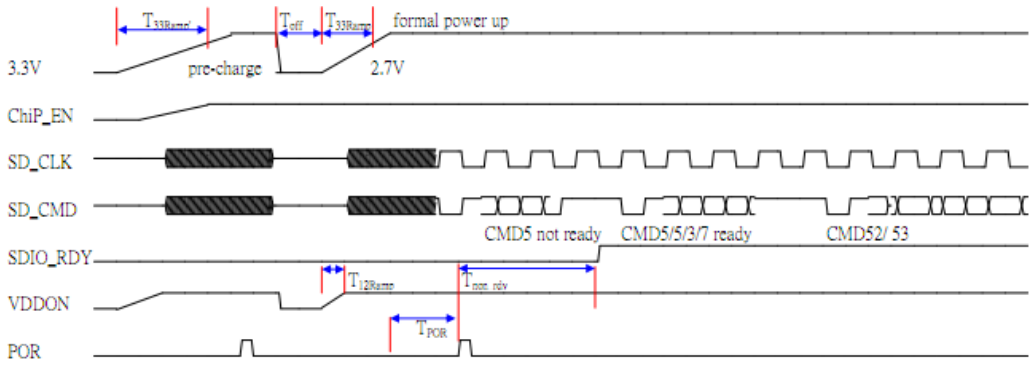
3.2 Current Consumption

Conditions : VDD33=3.3V ; Ta:25℃			
Use Case	VDD33 Current (average)		
	Typ	Max	Units
WiFi Radio Off (Linux Driver)	42	50	mA
WiFi Unassociated (Linux Driver)	40	60	mA
2.4G 1Mbps TX (RF-Test)	285	310	mA
2.4G 1Mbps RX (RF-Test)	60	70	mA
2.4G 11Mbps TX (RF-Test)	280	310	mA
2.4G 11Mbps RX (RF-Test)	59	70	mA
2.4G 6Mbps TX (RF-Test)	250	280	mA

2.4G 6Mbps RX (RF-Test)	63	77	mA
2.4G 54Mbps TX (RF-Test)	260	270	mA
2.4G 54Mbps RX (RF-Test)	60	65	mA
2.4G MCS0(HT20) TX (RF-Test)	255	272	mA
2.4G MCS0(HT20) RX (RF-Test)	65	70	mA
2.4G MCS7(HT20) TX (RF-Test)	220	285	mA
2.4G MCS7(HT20) RX (RF-Test)	63	70	mA
2.4G MCS7(HT40) TX (RF-Test)	220	270	mA
2.4G MCS7(HT40) RX (RF-Test)	63	80	mA
BT BR_1M DH5 TX(RF-Test)	125	152	mA
BT EDR_3M DH5 TX(RF-Test)	119	147	mA
BT LE_1M TX(RF-Test)	122	161	mA
BT BR_1M DH5 RX Active(RF-Test)	103	127	mA
BT EDR_3M DH5 RX Active(RF-Test)	102	130	mA
BT LE_1M RX Active(RF-Test)	110	133	mA

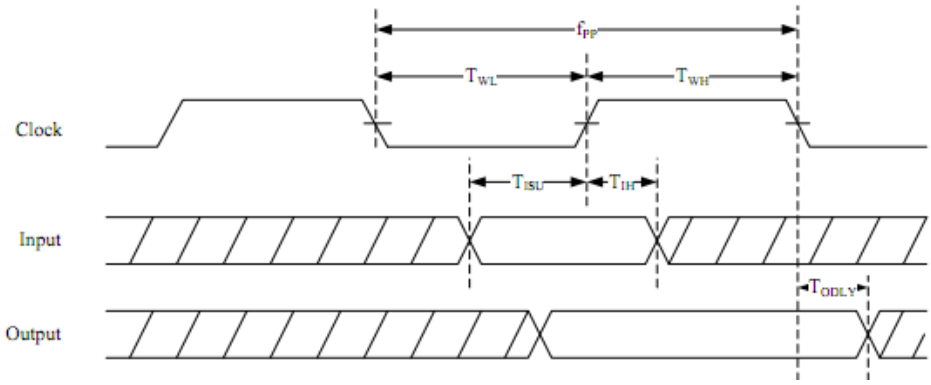
4. Interface Functional and Timing Specifications

4.1 SDIO Power On Sequence



Symbol	Min	Typical	Max	Unit
T_{33ramp}	0.2	-	No Limit	ms
T_{off}	250	500	1000	ms
T_{33ramp}	0.2	0.5	2.5	ms
T_{12ramp}	0.1	0.5	1.5	ms
T_{POR}	2	2	8	ms
$T_{non-rdy}$	1	2	10	ms

4.2 SDIO Timing



NO	Parameter	Mode	MIN	MAX	Unit
f_{PP}	Clock Frequency	Default	0	25	MHz
		HS	0	50	MHz
T_{WL}	Clock Low Time	DEF	10	-	ns
		HS	7	-	ns
T_{WH}	Clock High Time	DEF	10	-	ns
		HS	7	-	ns
T_{ISU}	Input Setup Time	DEF	5	-	ns
		HS	6	-	ns
T_{IH}	Input Hold Time	DEF	5	-	ns
		HS	2	-	ns
T_{ODLY}	Output Delay Time	DEF	-	14	ns
		HS	-	14	ns

5. WiFi RF Specifications

5.1 2.4G WiFi RF Specification

Conditions : VDD33=3.3V ; Ta:25℃	
Features	**Description**
WLAN Standard	IEEE 802.11b/g/n CSMA/CA
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;

Date 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;
Frequency Tolerance	≦ ±15ppm

5.2 Bluetooth RF Specifications

Conditions : VDD33=3.3V ; Ta:25℃	
Features	**Description**
Bluetooth Specification	Bluetooth v2.1+EDR/3.0+HS (Bluetooth Classic _ BT BR/EDR), Bluetooth 4.2 (Bluetooth Low Energy _ BT_LE) FHSS
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);

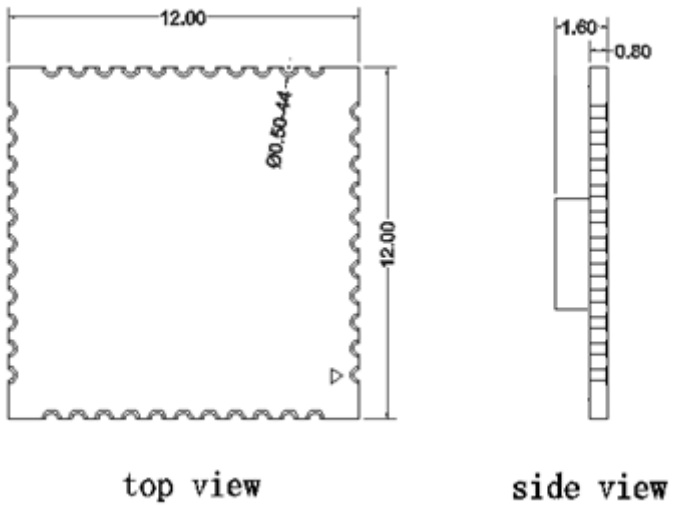
Power Classes	Bluetooth Classic: Class1; Bluetooth Low Energy: Class1.5;		
Date Rate & Modulation	BR_1Mbps: GFSK; EDR_2Mbps: π/4-DQPSK; EDR_3Mbps: 8DPSK; LE_1Mbps: GFSK;		
Bluetooth Transmitter Specifications			
Items	**Min**	**Typ**	**Max**
TX Power			
BR_1M TX Power	1	6	8
EDR_2/3M TX Power	1	6	8
LE_125K~1M TX Power	1	6	8
1DH1 TX Power	1	6	8
2DH3 TX Power	1	6	8
3DH5 TX Power	1	6	8
BR_1M Modulation Characteristics			
Δf1avg	145kHz	163kHz	--
Δf2max [For at least 99.9% of all Δf2max]	143kHz	146kHz	--
Δf1avg / Δf2max	1.01	0.12	--
EDR Modulation Accuracy			
RMS DEVM (EDR_2M)	--	10%	20%
99% DEVM (EDR_2M)	--	13%	30%
Peak DEVM (EDR_2M)	--	17%	35%
RMS DEVM (EDR_3M)	--	9%	13%
99% DEVM (EDR_3M)	--	11%	20%
Peak DEVM (EDR_3M)	--	14%	25%
LE_Modulation characteristics			
Δf1avg (LE_1M)	207kHz	210kHz	--
Δf2max[For at least 99.9% of all	195kHz	194kHz	--

Δf2max] (LE_1M)			
Δf1avg / Δf2max(LE_1M)	1.06	1.08	--

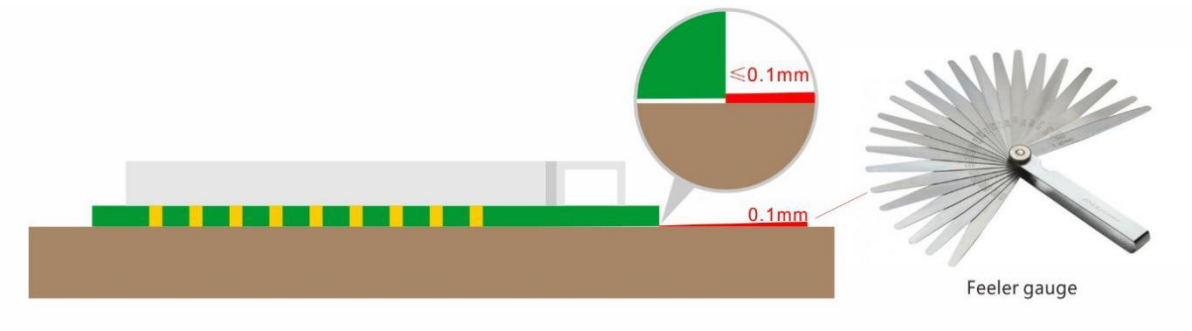
Bluetooth Receiver Specifications				
Items	Sensitivity		Maximum Input Level	
	Input Level(Typ)	BER	Input Level(Typ)	BER
BR_1M	-92dBm	≦0.1%	-20dBm	≦0.1%
EDR_2M	-90dBm	≦0.01%	-20dBm	≦0.1%
EDR_3M	-86dBm	≦0.01%	-20dBm	≦0.1%
LE_1M	-92dBm	≦30.8%	-20dBm	≦0.1%
1DH1	-92dBm	≦30.8%	-20dBm	≦0.1%
2DH3	-90dBm	≦30.8%	-20dBm	≦0.1%
3DH5	-86dBm	≦30.8%	-20dBm	≦0.1%

6. Mechanical Specifications

6.1 Module Outline Drawing

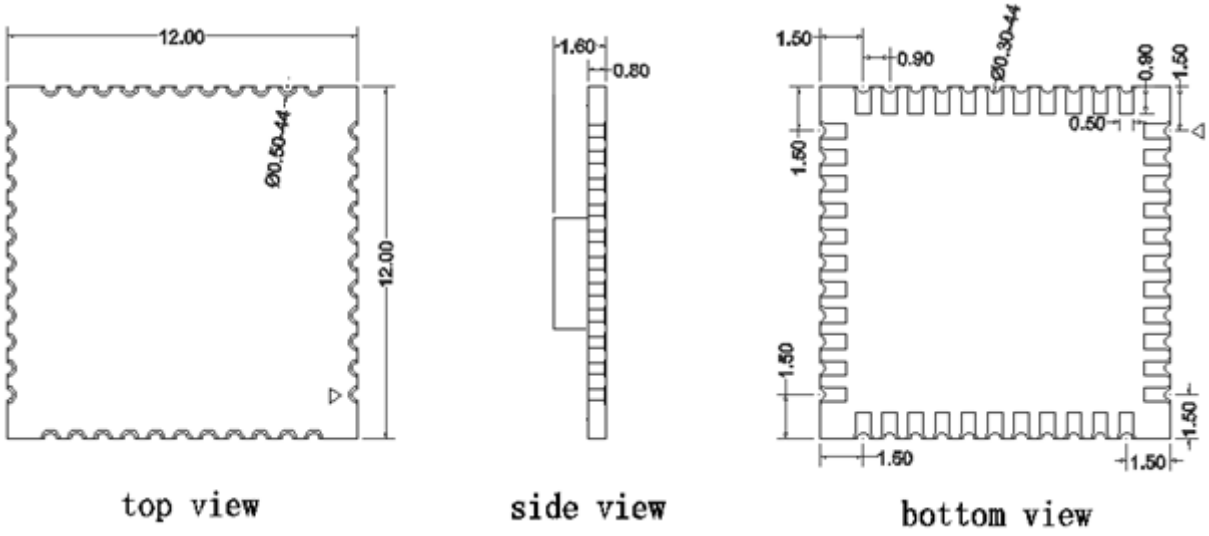


Module dimension: 12.0*12.0*1.6mm (L*W*H; Tolerance: ±0.15mm)



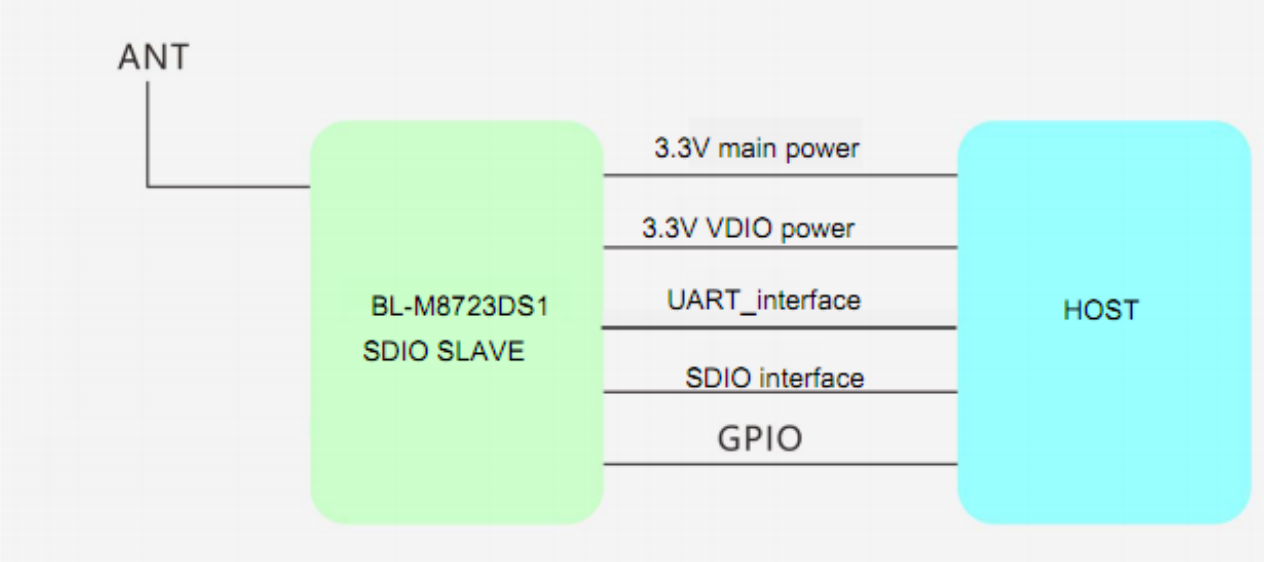
Module Bow and Twist：≤0.1mm

6.2 Mechanical Dimensions

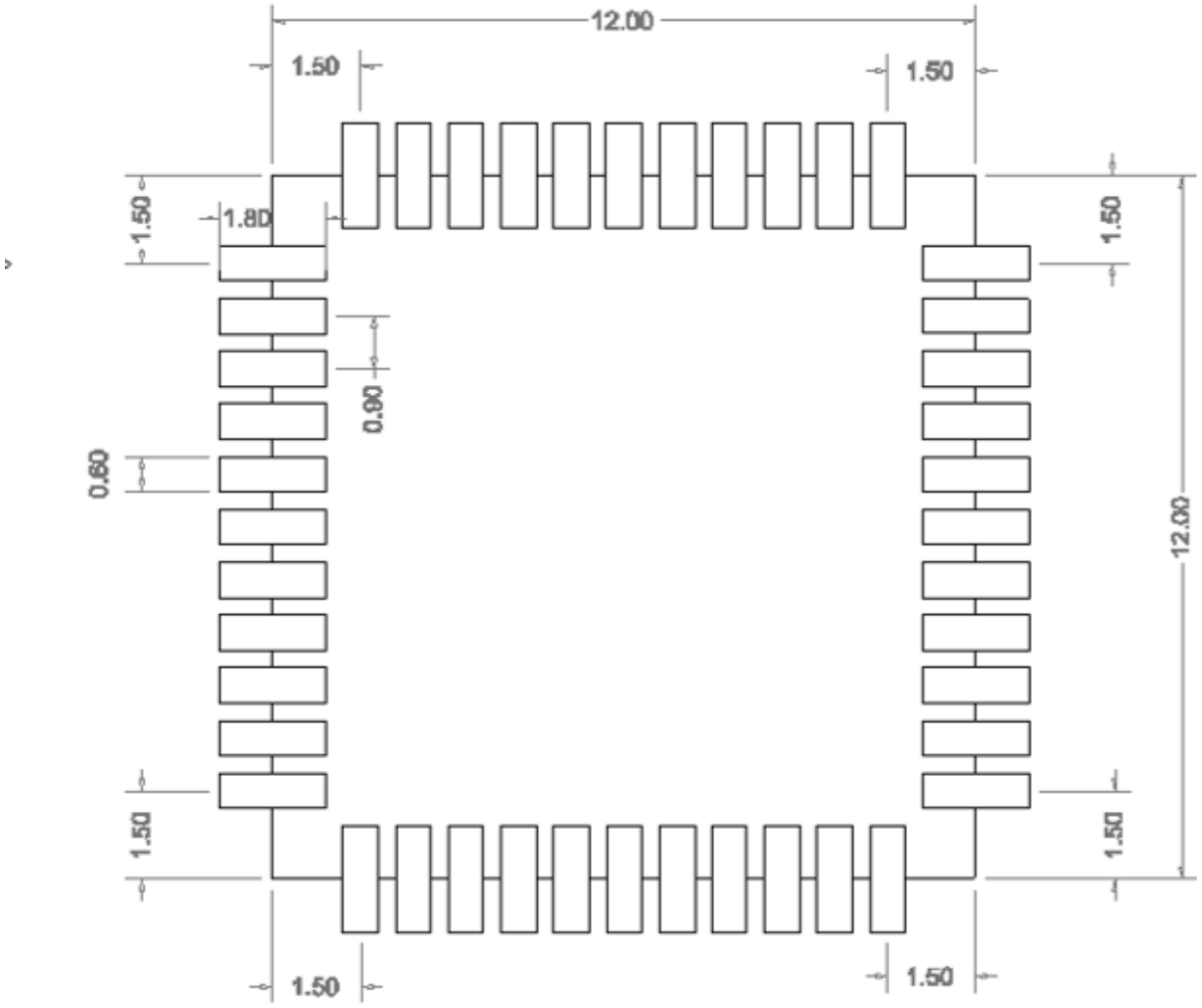


7. Application Information

7.1 Typical Application Circuit



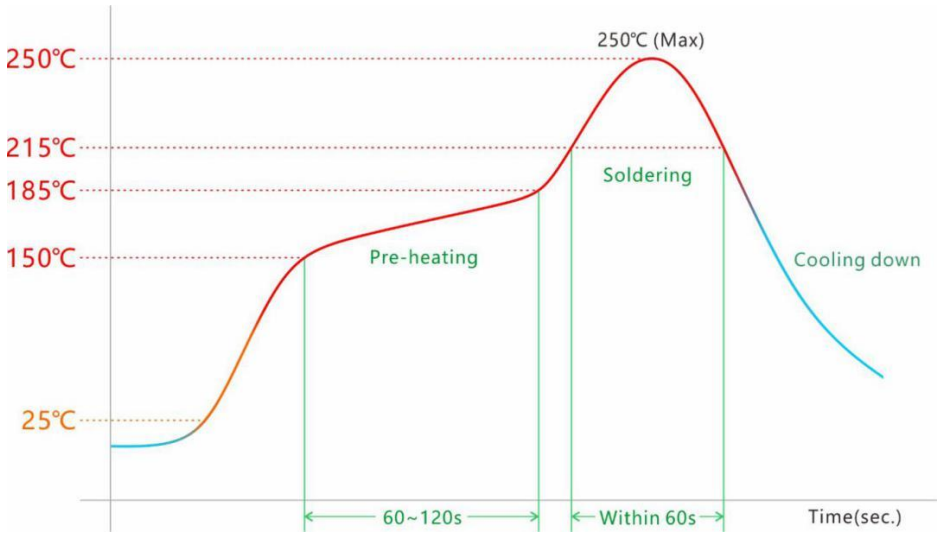
7.2 Recommend PCB Layout Footprint



Design size mm

Top View

7.3 Reflow Soldering Standard Conditions



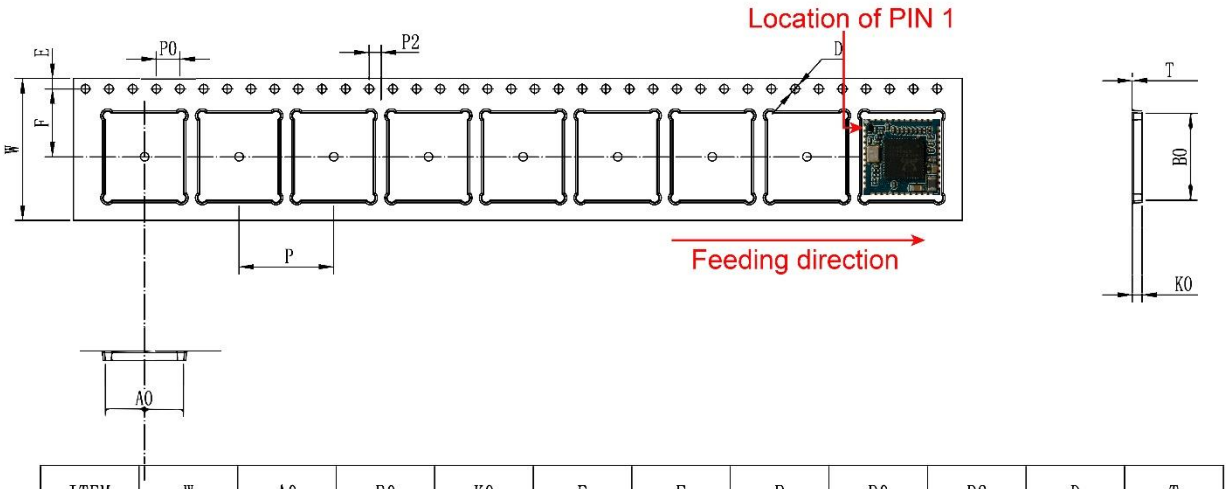
Please use the reflow within 2 times.
Set up the highest temperature within 250℃.

8. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8723DS-CG	Realtek	
2	PCB	BL-M8723DS1	Shen Zhen Tie Fa Technology limited	
			Guangdong KINGSHINE ELECTRONICS CO., LTD	
			Quzhou Sunlord Electronics Co., Ltd	
3	Crystal	24MHz-12pF-10ppm-2520	HUBEI TKD ELECTRONICS TECHNOLOGY CO., LTD.	
			LUCKI CM ELECTRONICS CO., LTD	
			HOSONIC ELECTRONIC CO., LTD.	
			SHENZHEN KAIYUEXIANG ELECTRONICS CO., LTD	

9. Package and Storage Information

9.1 Package Dimensions



ITEM	W	A0	B0	K0	E	F	P	P0	P2	D	T
DIM	24.00+0.3	12.50±0.1	12.50±0.1	2.40±0.1	1.75±0.1	11.5±0.1	20.00±0.1	4.00±0.1	2.00±0.1	Ø1.5±0.1	0.30±0.05

Package specification:

1. 2,000 modules per roll and 10,000 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 25.3mm (with a width of 21.3mm carrying belt).
4. Put 1 package of dry agent (20g) and humidity card in each anti-static vacuum bag.
5. Each carton is packed with 5 boxes.

9.2 Storage Conditions

Absolute Maximum Ratings:
Storage temperature: -45℃ 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:
The Module is a static-sensitive electronic device.
Do not operate or store near strong electrostatic fields.
Take proper ESD precautions!

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

0cm 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: **2AL6KBL-M8723DS1**"

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

This module is Limited single modular without shielding, host manufacturer have to consult with module manufacturer for the module limiting conditions when integrate the module in the host. module manufacturer should reviews detailed test data or host designs prior to giving the host manufacturer approval.

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 **2AL6KBL-M8723DS1** 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.

Model	Type	Connector	Peak gain (dBi)				
			2400-2483.5 MHz	5150-5250 MHz	5250-5350 MHz	5470-5725 MHz	5725-5850 MHz
2400-2483.5 MHz	External Antenna	/	2.0dBi	/	/	/	/

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains FCC ID:2AL6KBL-M8723DS1".

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.