



# **BL-M8723DS1**

**802.11n 150Mbps SDIO**

**WiFi and BT Combo Module Specification**

**SHENZHEN BILIAN ELECTRONIC CO., LTD**

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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

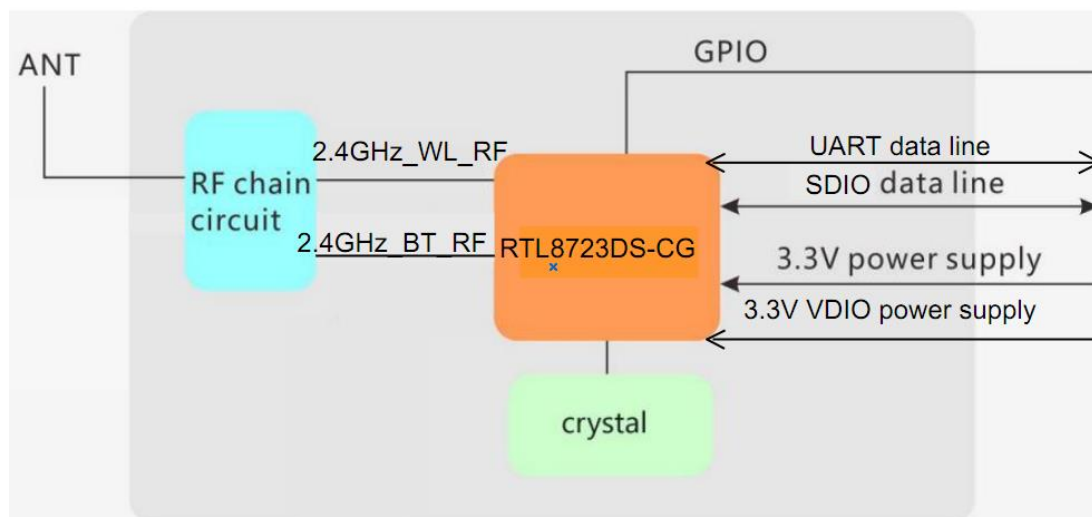
## 1. Introduction

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

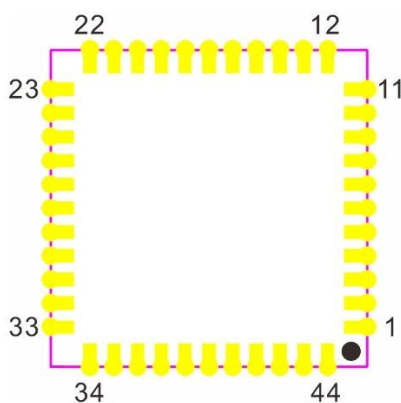
### 1.2 Block Diagram



## 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°C to +70°C
Storage temperature	-45°C to +85°C
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	°C	
External Antenna VSWR	1	1.7	2	/	
Supply Voltage	VDD33/VDIO	3.1	3.3	3.5	V

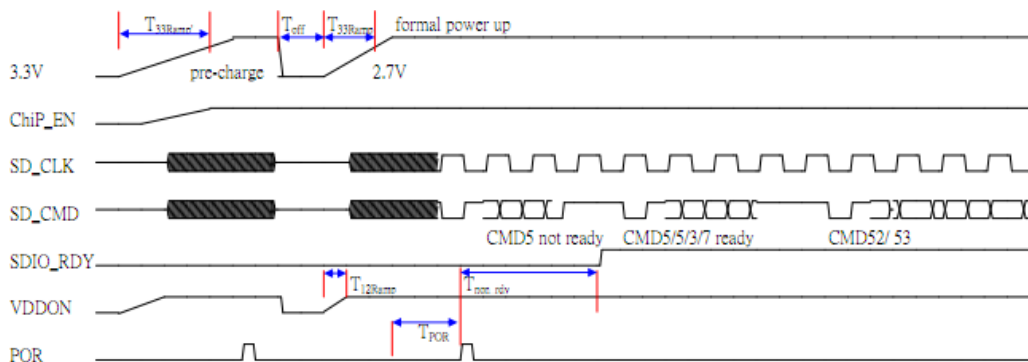
#### 3.2 Current Consumption

Conditions : VDD33=3.3V ; Ta:25°C			
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

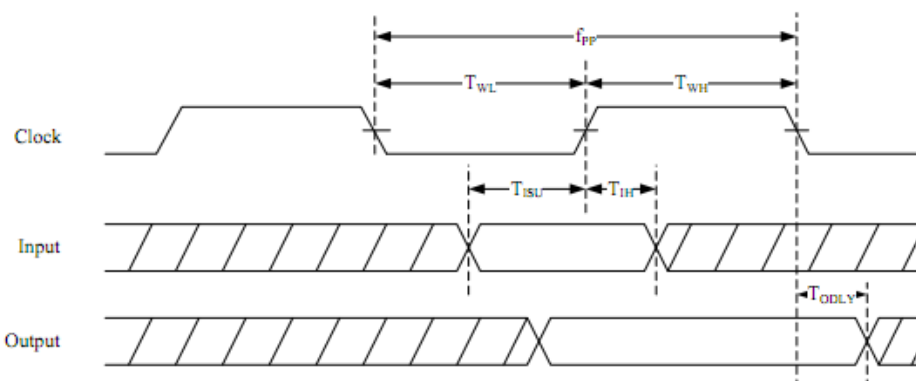
## 4. Interface Functional and Timing Specifications

### 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°C	
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	$\leq \pm 15\text{ppm}$		
<b>2.4G Transmitter Specifications</b>			
TX Rate	TX Power	TX Power Tolerance	EVM
802.11b@1~11Mbps	17dBm	$\pm 2.0\text{dBm}$	$\leq -10\text{dB}$
802.11g@6Mbps	17dBm	$\pm 1.5\text{dBm}$	$\leq -10\text{dB}$
802.11g@54Mbps	14dBm	$\pm 1.5\text{dBm}$	$\leq -25\text{dB}$
802.11n@HT20_MCS0	16dBm	$\pm 1.5\text{dBm}$	$\leq -10\text{dB}$
802.11n@HT20_MCS7	14dBm	$\pm 1.5\text{dBm}$	$\leq -28\text{dB}$
802.11n@HT40_MCS0	16dBm	$\pm 1.5\text{dBm}$	$\leq -10\text{dB}$
802.11n@HT40_MCS7	13dBm	$\pm 1.5\text{dBm}$	$\leq -28\text{dB}$
<b>2.4G Receiver Specifications</b>			
RX Rate	Min Input Level(Typ)	Max Input Level(Typ)	PER
802.11b@1Mbps	-93dBm	-10dBm	< 8%
802.11b@11Mbps	-86dBm	-10dBm	< 8%
802.11g@6Mbps	-90dBm	-15dBm	< 10%
802.11g@54Mbps	-72dBm	-15dBm	< 10%
802.11n@HT20_MCS0	-88dBm	-15dBm	< 10%
802.11n@HT20_MCS7	-67dBm	-15dBm	< 10%
802.11n@HT40_MCS0	-86dBm	-15dBm	< 10%
802.11n@HT40_MCS7	-66dBm	-15dBm	< 10%

## 5.2 Bluetooth RF Specifications

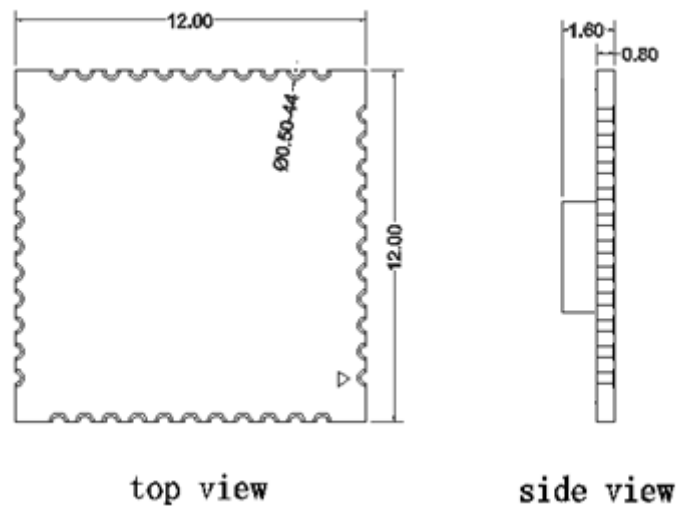
<b>Conditions : VDD33=3.3V ; Ta:25°C</b>	
Features	Description
Bluetooth Specification	Bluetooth v2.1+EDR/3.0+HS (Bluetooth Classic _ BT BR/EDR), Bluetooth 4.2 (Bluetooth Low Energy _ BT_LE) FHSS
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)
Channels	Bluetooth Classic: Ch0~Ch78 (For 1MHz Channels); 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: $\pi/4$ -DQPSK; EDR_3Mbps: 8DPSK; LE_1Mbps: GFSK;		
<b>Bluetooth Transmitter Specifications</b>			
<b>Items</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>
<b>TX Power</b>			
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
<b>BR_1M Modulation Characteristics</b>			
$\Delta f_{1avg}$	145kHz	163kHz	--
$\Delta f_{2max}$ [For at least 99.9% of all $\Delta f_{2max}$ ]	143kHz	146kHz	--
$\Delta f_{1avg} / \Delta f_{2max}$	1.01	0.12	--
<b>EDR Modulation Accuracy</b>			
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%
<b>LE Modulation characteristics</b>			
$\Delta f_{1avg}$ (LE_1M)	207kHz	210kHz	--
$\Delta f_{2max}$ [For at least 99.9% of all	195kHz	194kHz	--

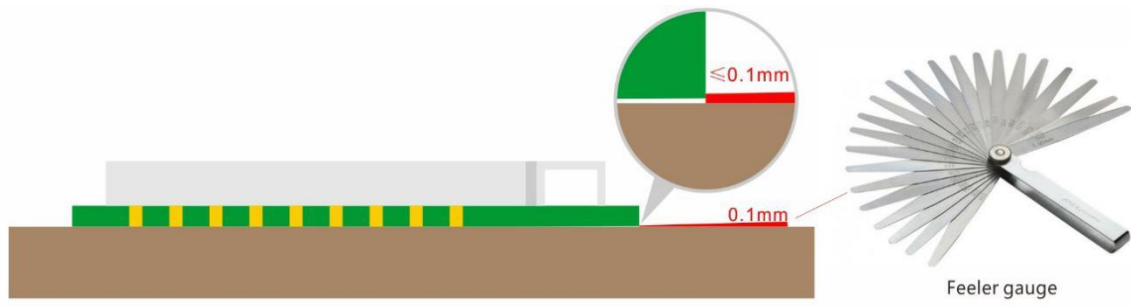
$\Delta f_{2max}$ ] (LE_1M)				
$\Delta f_{1avg} / \Delta f_{2max}$ (LE_1M)	1.06	1.08	--	
<b>Bluetooth Receiver Specifications</b>				
Items	Sensitivity		Maximum Input Level	
	Input Level(Typ)	BER	Input Level(Typ)	BER
BR_1M	-92dBm	$\leq 0.1\%$	-20dBm	$\leq 0.1\%$
EDR_2M	-90dBm	$\leq 0.01\%$	-20dBm	$\leq 0.1\%$
EDR_3M	-86dBm	$\leq 0.01\%$	-20dBm	$\leq 0.1\%$
LE_1M	-92dBm	$\leq 30.8\%$	-20dBm	$\leq 0.1\%$
1DH1	-92dBm	$\leq 30.8\%$	-20dBm	$\leq 0.1\%$
2DH3	-90dBm	$\leq 30.8\%$	-20dBm	$\leq 0.1\%$
3DH5	-86dBm	$\leq 30.8\%$	-20dBm	$\leq 0.1\%$

## 6. Mechanical Specifications

### 6.1 Module Outline Drawing

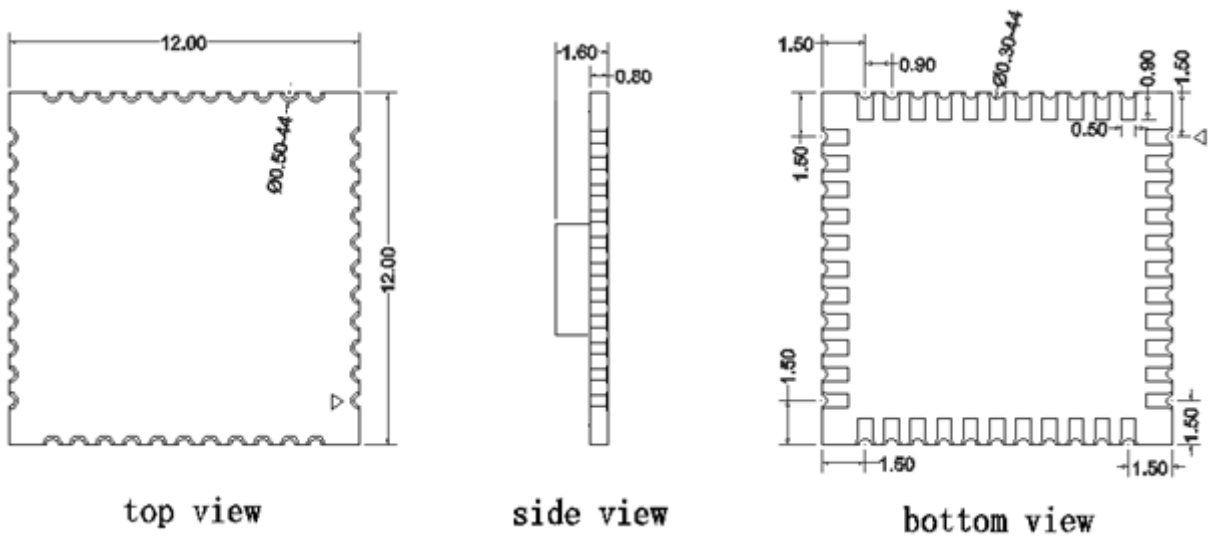


Module dimension: 12.0\*12.0\*1.6mm (L\*W\*H; Tolerance:  $\pm 0.15$ mm)



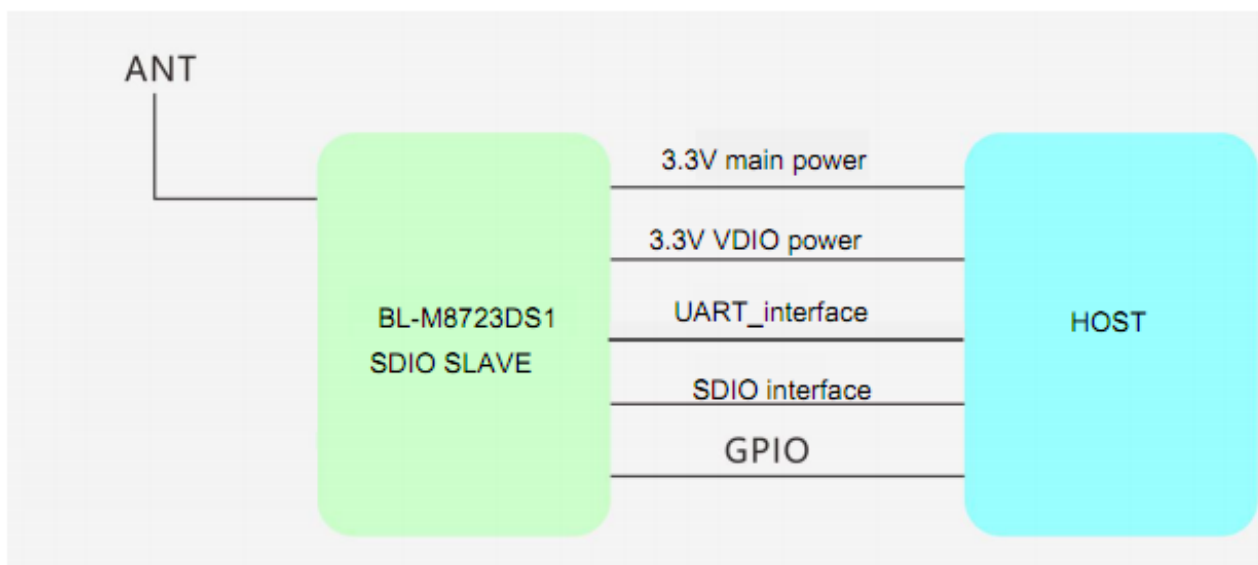
Module Bow and Twist:  $\leq 0.1\text{mm}$

## 6.2 Mechanical Dimensions

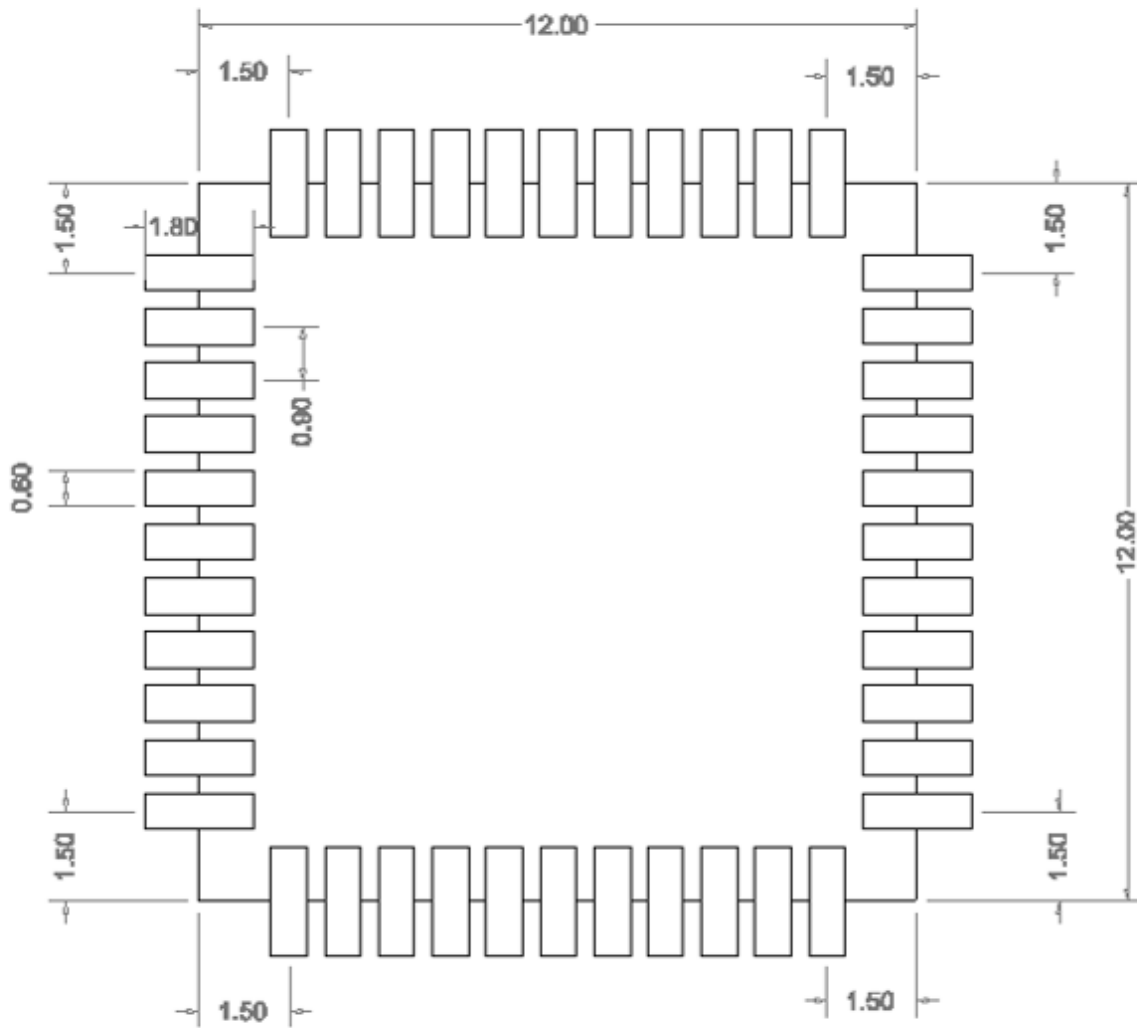


## 7. Application Information

### 7.1 Typical Application Circuit



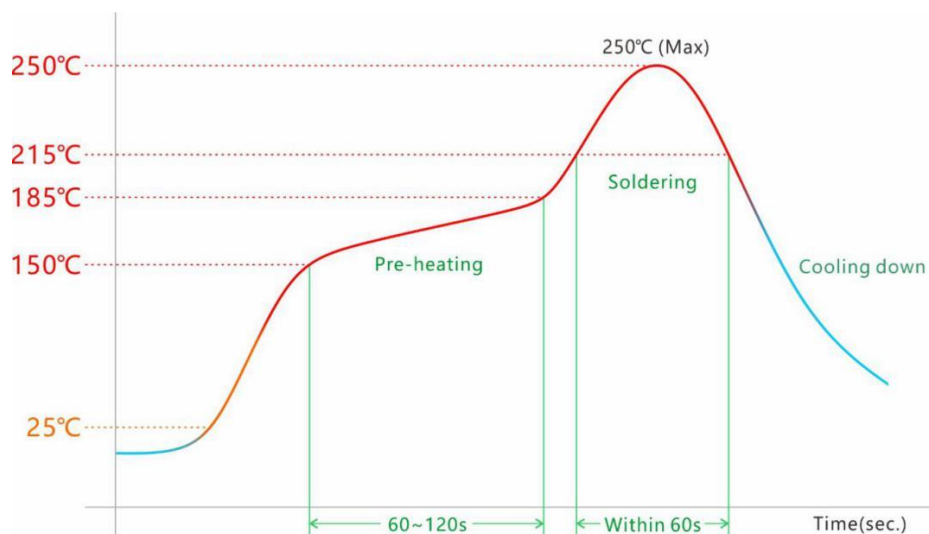
7.2 Recommend PCB Layout Footprint



Design size mm

Top View

### 7.3 Reflow Soldering Standard Conditions



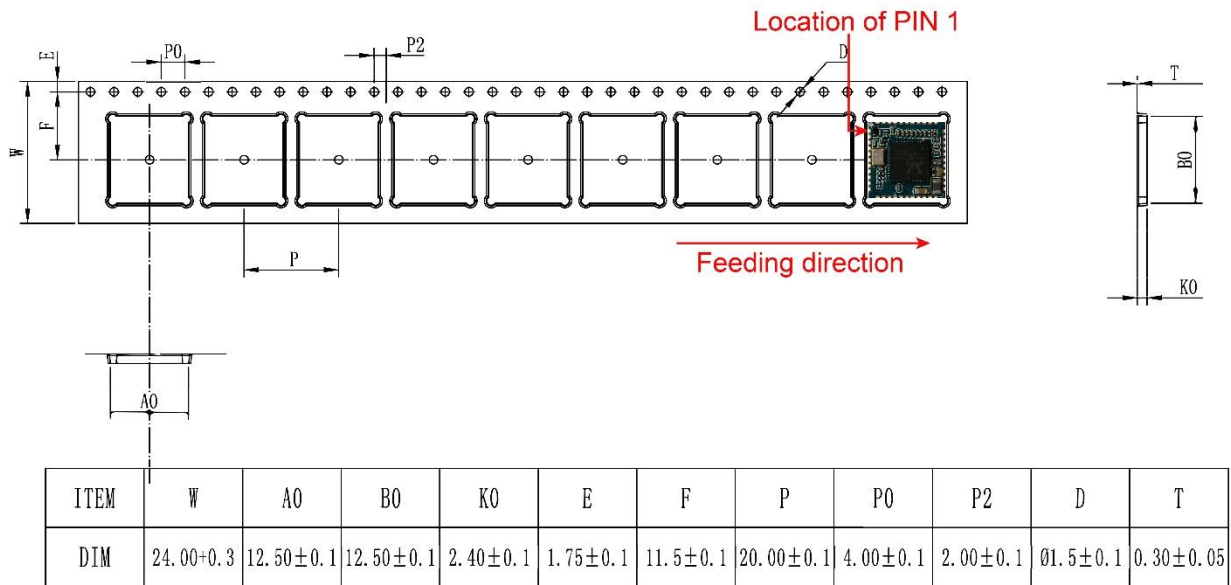
Please use the reflow within 2 times.  
Set up the highest temperature within 250°C.

## 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



Package specification:

- 1,200 modules per roll and 10,000 modules per box.
- Outer box size: 37.5\*36\*29cm.
- 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).
- Put 1 package of dry agent (20g) and humidity card in each anti-static vacuum bag.
- Each carton is packed with 5 boxes.



## 9.2 Storage Conditions

### Absolute Maximum Ratings:

Storage temperature: -45°C to +85°C

Storage humidity: 10% to 95% RH (Non-Condensing)

### Recommended Storage Conditions:

Storage temperature: 5°C to +40°C

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°C, 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!