



## **BL-M8723DS1**

**802.11n 150Mbps WLAN+BTv4.2**

**SDIO Module Specification**

**SHENZHEN BILIAN ELECTRONIC CO.,LTD**

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(TopView)



(BottomView)

Module Name:BL-M8723DS1

Module Type:802.11b/g/n 150Mbps WLAN + Bluetooth v4.2 SDIOModule

Revision:V1.0

CustomerApproval:

Company:

Title:

|            |       |
|------------|-------|
| Signature: | Date: |
|------------|-------|

LB-linkApproval:

|        |  |
|--------|--|
| Title: |  |
|--------|--|

|            |       |
|------------|-------|
| Signature: | Date: |
|------------|-------|

## RevisionHistory

| Revision   | Summary                          | ReleaseDate | RevisedBy |
|------------|----------------------------------|-------------|-----------|
| <b>0.1</b> | Initial release                  | 2022-03-21  |           |
| <b>1.0</b> | official release(Update picture) | 2023-06-16  | Drq       |
|            |                                  |             |           |

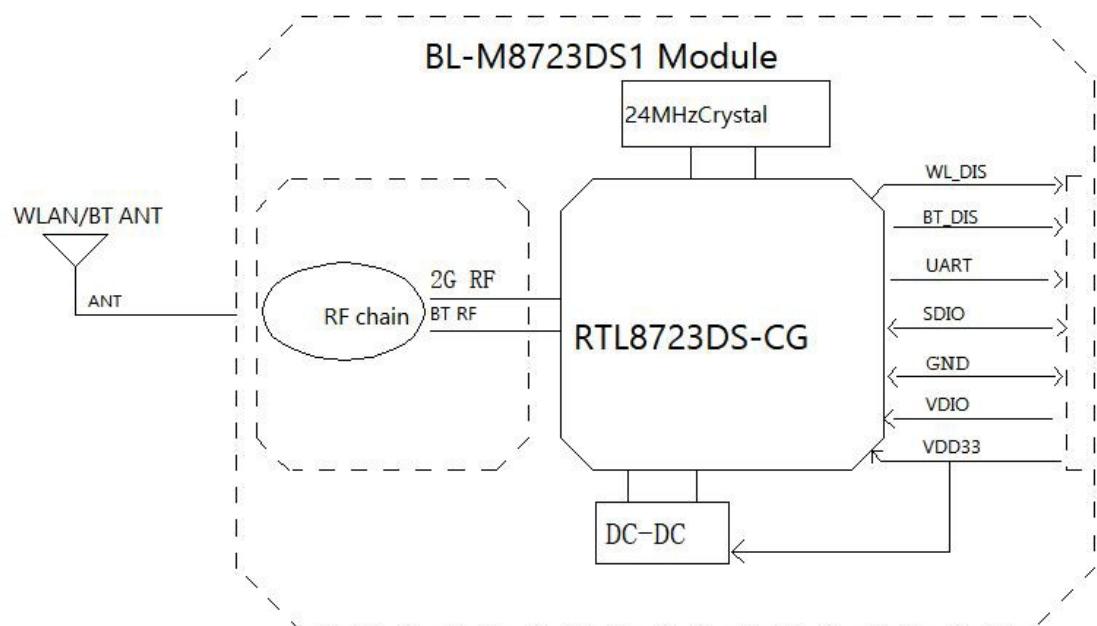
## 1. Introduction

BL-M8723DS1 is a highly integrated IEEE802.11b/g/n WLAN and Bluetooth 2.1/4.2 combomodulebaseonRTL8723DSchip,whichcombinesMCUwithSDIOandHS-UARTinterface,aWLANMAC,a1T1R capable WLAN baseband, BT Protocol Stack, BT Baseband, modem, and WLAN/BT RF in asinglechip. The module provides a complete solution for a high throughput performance integrated WLAN and Bluetooth.

### 1.1 Features

- Operating Frequencies: 2.4~2.4835GHz
- IEEE Standards: IEEE802.11b/g/n
- Wireless PHY rate can reach up to 150Mbps
- Supports Bluetooth v2.1+EDR/v4.2
- Connect to external antenna through half holepad
- Power Supply: 3.3V main power and 1.8V/3.3V I/O power

### 1.2 Block Diagram



### 1.3 General Specifications

|                      |   |
|----------------------|---|
| ModuleName           | BL-M8723DS1   |
| Chipset              | RTL8723DS-CG  |
| WLANStandards        | IEEE802.11b/g/n   |
| BTStandards          | Bluetooth Core Specificationv4.2/2.1                              |
| HostInterface        | SDIO for WLAN & UART forBluetooth                                 |
| Antenna              | Connect to the external antenna through half holepad              |
| Dimension            | 12*12*2.1mm(L*W*H)  |
| PowerSupply          | DC 3.3V±0.2V @ 450 mA (Max)<br>mainpowerDC 3.3V±0.2V or 1.8V±0.1V |
| OperationTemperature | -20°C to+70°C   |
| OperationHumidity    | 10% to 95% RH(Non-Condensing)                                     |

### 2. Pin Assignments



( TopView )

#### 2.1 Pin Definition

| No | PinName | Type | I/OLevel | Description   |
|----|---------|------|----------|---|
| 1  | BT_DIS# | I    | VDD33    | Shared withGPIO11.<br>This pin can externally shut down BT function when BT DIS #Is pulled Low, and UART interface will be also disabled. This pin can be also defined as the BT Radio-off function with hostinterface remaining connected. There is no pull-up resistor inside the module and high level input is required to enable |
| 2  | NC      | /    |          | NC  |
| 3  | GND     | P    |          | Groundconnections   |
| 4  | NC      | /    |          | NC  |
| 5  | NC      | /    |          | NC  |

|    |                  |    |       |  |
|----|------------------|----|-------|--|
| 6  | NC               | /  |       | NC   |
| 7  | NC               | /  |       | NC   |
| 8  | GND              | P  |       | Groundconnections.<br>( This pin has been connected to other GNDs on the module, so it NC or connected to other signals such as UART_CTS in the customer's application circuit will not affect normal use)   |
| 9  | UART_TX          | O  | VDIO  | High-Speed UART Dataoutput   |
| 10 | UART_RX          | I  | VDIO  | High-Speed UART Datainput  |
| 11 | UART_CTS         | I  | VDIO  | High-Speed UART CTSinput   |
| 12 | GND              | RF |       | RF Groundconnections   |
| 13 | WLAN/BTANT       | RF |       | RF Pad for 2.4G WLAN/BTANT   |
| 14 | GND              | RF |       | RF Groundconnections   |
| 15 | NC               | /  |       | NC   |
| 16 | NC               | /  |       | NC   |
| 17 | HOST_WAKE_DEV    | I  | VDIO  | Shared with GPIO13.<br>This pin can be configured as the host wakes up the WLAN or Bluetooth controller or both of them in Remote Wake   |
| 18 | DEV_WAKE_HOST_BT | O  | VDIO  | Shared with GPIO14.<br>This pin is shared with either WLAN or BT functions to wake up the host when the remote wake function is enabled. The polarity can be defined by the customer. It can be configured as a shared wake up pin by both WL and BT when any of WL and BT function issue the wake signal to the host.                                       |
| 19 | NC               | /  |       | NC   |
| 20 | VDD33            | P  |       | DC 3.3V powersupply  |
| 21 | NC               | /  |       | NC   |
| 22 | NC               | /  |       | NC   |
| 23 | WL_DIS#          | I  | VDD33 | Shared with GPIO9.<br>This pin can externally shut down WLAN function when WL_DIS# is pulled low, and SDIO interface will be also disabled. This pin can also be configured as the WLAN Radio-off function with host interface remaining connected. There is no pull-up resistor inside the module and high level input is required to enable WLAN function. |
| 24 | DEV_WAKE_HOST_WL | O  | VDIO  | Shared with GPIO6.<br>This pin is shared with either WLAN or BT functions to wake up the host when the remote wake function is enabled. The polarity can be defined by the customer. It can be   |

|    |          |     |       |   |
|----|----------|-----|-------|---|
|    |          |     |       | wake up pin by both WL and BT when any of WL and BTfunction issue the wake signal to thehost.   |
| 25 | SD_D2    | I/O | VDIO  | SDIO dataline2  |
| 26 | SD_D3    | I/O | VDIO  | SDIO dataline3  |
| 27 | SD_CMD   | I/O | VDIO  | SDIO commandline  |
| 28 | SD_CLK   | I   | VDIO  | SDIO clockinput   |
| 29 | SD_D0    | I/O | VDIO  | SDIO dataline0  |
| 30 | SD_D1    | I/O | VDIO  | SDIO dataline1  |
| 31 | GND      | P   |       | Groundconnections   |
| 32 | NC       | /   |       | NC  |
| 33 | VDIO     | P   |       | 1.8V or 3.3V power supply for some digitalI/O   |
| 34 | NC       | /   |       | NC  |
| 35 | CLK_IN   | I   | VDD33 | General Purpose Input/Output PinGPIO8   |
| 36 | PCM_OUT  | O   | VDIO  | 1. PCM data output, shared withGPIO1.<br>2. Strap Pin, internal pull low by 100K resistor to set "SPS_Mode" , do not pull High during |
| 37 | PCM_CLK  | I   | VDIO  | PCM Clock input, shared withGPIO3   |
| 38 | PCM_IN   | I   | VDIO  | PCM data input, shared withGPIO0  |
| 39 | PCM_SYNC | O   | VDIO  | PCM synchronization control, shared withGPIO2   |
| 40 | NC       | /   |       | NC  |
| 41 | NC       | /   |       | NC  |
| 42 | GND      | P   |       | Groundconnections   |
| 43 | NC       | /   |       | NC  |
| 44 | GND      | P   |       | Groundconnections   |

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

### 3. Electrical and Thermal Specifications

#### 3.1 Recommended Operating Conditions

| Parameters                   |            | Min | Typ | Max | Units |
|------------------------------|------------|-----|-----|-----|-------|
| Ambient OperatingTemperature |            | -20 | 25  | 70  | °C    |
| External AntennaVSWR         |            |     | 1.7 | 2   | /     |
| SupplyVoltage                | VDD33      | 3.1 | 3.3 | 3.5 | V     |
|                              | VDIO(3.3V) | 3.1 | 3.3 | 3.5 | V     |
|                              | VDIO(1.8V) | 1.7 | 1.8 | 1.9 | V     |

### 3.2 Digital 3.3V GPIO DC Specifications

| Symbol | Parameter          | Min  | Typ | Max  | Units |
|--------|--------------------|------|-----|------|-------|
| VIH    | Input HighVoltage  | 2.0  | 3.3 | 3.6  | V     |
| VIL    | Input LowVoltage   | --   | 0   | 0.9  | V     |
| VOH    | Output HighVoltage | 2.97 | --  | 3.3  | V     |
| VOL    | Output LowVoltage  | 0    | --  | 0.33 | V     |

### 3.3 Digital 1.8V IO DC Specifications

| Symbol | Parameter          | Min  | Typ | Max  | Units |
|--------|--------------------|------|-----|------|-------|
| VIH    | Input HighVoltage  | 1.3  | 1.8 | 1.9  | V     |
| VIL    | Input LowVoltage   | --   | 0   | 0.8  | V     |
| VOH    | Output HighVoltage | 1.62 | --  | 1.8  | V     |
| VOL    | Output LowVoltage  | 0    | --  | 0.18 | V     |

### 3.4 Current Consumption

| Conditions : VDD33=3.3V ;Ta:25°C          |                          |                           |       |
|---|--------------------------|---------------------------|-------|
| UseCase                                   | VDD33Current             |                           |       |
|   | Typ ( I <sub>RMS</sub> ) | Max ( I <sub>Peak</sub> ) | Units |
| WLAN Radio Off (LinuxDriver)              | 42                       | 50                        | mA    |
| WLAN Unassociated (LinuxDriver)           | 40                       | 60                        | mA    |
| 2.4G 11b 1Mbps TX@ 17dBm (TX RFtest)      | 285                      | 310                       | mA    |
| 2.4G 11b 1Mbps RX(RF-Test)                | 60                       | 70                        | mA    |
| 2.4G 11b 11Mbps TX@ 17dBm (TX RFtest)     | 280                      | 310                       | mA    |
| 2.4G 11b 11Mbps RX(RF-Test)               | 59                       | 70                        | mA    |
| 2.4G 11g 6Mbps TX@ 17dBm (TX RFtest)      | 250                      | 280                       | mA    |
| 2.4G 11g 6Mbps RX(RF-Test)                | 63                       | 77                        | mA    |
| 2.4G 11g 54Mbps TX@ 15dBm (TX RFtest)     | 260                      | 270                       | mA    |
| 2.4G 11g 54Mbps RX(RF-Test)               | 60                       | 65                        | mA    |
| 2.4G 11n HT20_MCS0 TX@ 17dBm (TX RFtest)  | 255                      | 272                       | mA    |
| 2.4G 11n HT20_MCS0 RX(RF-Test)            | 65                       | 70                        | mA    |
| 2.4G 11n HT20_MCS7 TX @ 14dBm (TX RFtest) | 220                      | 285                       | mA    |

|  |     |     |    |
|--|-----|-----|----|
| 2.4G 11n HT20_MCS7 RX(RF-Test)           | 63  | 70  | mA |
| 2.4G 11n HT40_MCS7 TX@ 14dBm (TX RFtest) | 220 | 270 | mA |
| 2.4G 11n HT40_MCS7 RX(RF-Test)           | 63  | 80  | mA |
| BT                                       |     |     |    |
| BT BR_1M DH5 TX@ 5dBm(RF-Test)           | 125 | 152 | mA |
| BT EDR_3M DH5 TX@ 5dBm(RF-Test)          | 119 | 147 | mA |
| BT LE_1M TX@ 5dBm(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. WLAN RF Specifications

### 4.1 2.4G WLAN RF Specification

| Conditions : VDD33=3.3V ;Ta:25°C |   |
|----------------------------------|---|
| Features                         | Description   |
| WLANStandard                     | IEEE802.11b/g/n   |
| FrequencyRange                   | 2.4~2.4835GHz (2.4GHz ISMBand)  |
| Channels                         | Ch1~Ch13 (For 20MHzChannels)  |
| Modulation                       | 802.11b (DSSS): DBPSK, DQPSK,CCK;<br>802.11g (OFDM): BPSK, QPSK, 16QAM,64QAM;<br>802.11n (OFDM): BPSK, QPSK, 16QAM,64QAM;   |
| DataRate                         | 802.11b: 1, 2, 5.5,11Mbps;<br>802.11g: 6, 9, 12, 18, 24, 36, 48,54Mbps;<br>802.11n (HT20): MCS0~MCS7(1T1R_SISO)6.5~72.2Mbps;<br>802.11n (HT40): MCS0~MCS7(1T1R_SISO)13.5~150Mbps; |
| FrequencyTolerance               | ≤±20ppm   |

**2.4G Transmitter Specifications**(TX power of some rates is calibrated, customers can define the target TX power of other rates by modifying configuration file of the driver software. Customers must define the TX power same or lower than recommended Target TX Power as below)

| TXRate         | TXPower ( dBm )                | TX PowerTolerance ( dBm ) | EVM ( dB ) |
|----------------|--------------------------------|---------------------------|------------|
| 802.11b@1Mbps  | Recommended Target TX Power:17 | ±1.5                      | ≤-10       |
| 802.11b@11Mbps | Calibrated TX Power : 17       | ±1.5                      | ≤-10       |
| 802.11g@6Mbps  | Recommended Target TX Power:17 | ±1.5                      | ≤-10       |
| 802.11g@54Mbps | Calibrated TX Power : 15       | ±1.5                      | ≤-25       |

|                   |                               |      |      |
|-------------------|-------------------------------|------|------|
| 802.11n@HT20_MCS0 | Recommended TargetTX Power:17 | ±1.5 | ≤-10 |
| 802.11n@HT20_MCS7 | Calibrated TX Power : 14      | ±1.5 | ≤-28 |
| 802.11n@HT40_MCS0 | Recommended TargetTX Power:17 | ±1.5 | ≤-10 |
| 802.11n@HT40_MCS7 | Calibrated TX Power : 14      | ±1.5 | ≤-28 |

#### 2.4G Receiver Specifications

| RXRate            | Min Input Level ( Typ, dBm ) | Max InputLevel ( Typ,dBm ) | PER  |
|-------------------|------------------------------|----------------------------|------|
| 802.11b@1Mbps     | -93                          | -10                        | <8%  |
| 802.11b@11Mbps    | -86                          | -10                        | <8%  |
| 802.11g@6Mbps     | -90                          | -15                        | <10% |
| 802.11g@54Mbps    | -72                          | -15                        | <10% |
| 802.11n@HT20_MCS0 | -88                          | -15                        | <10% |
| 802.11n@HT20_MCS7 | -67                          | -15                        | <10% |
| 802.11n@HT40_MCS0 | -86                          | -15                        | <10% |
| 802.11n@HT40_MCS7 | -66                          | -15                        | <10% |

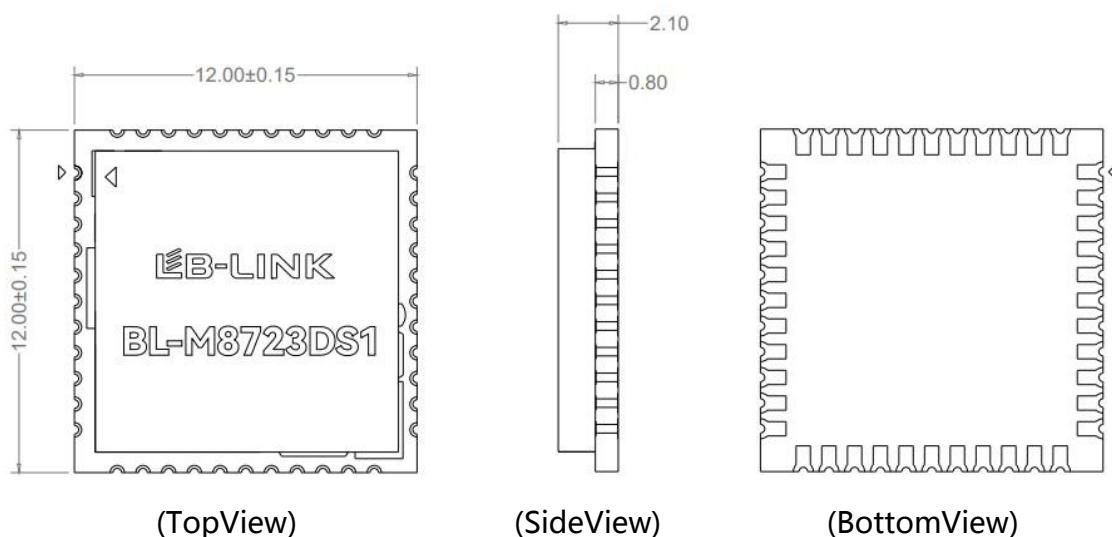
#### 4.2 Bluetooth RF Specification

| Conditions : VDD33=3.3V ;Ta:25°C             |   |             |             |
|--|---|-------------|-------------|
| Features                                     | Description   |             |             |
| BluetoothSpecification                       | Bluetooth Core Specificationv4.2/v2.1   |             |             |
| FrequencyRange                               | 2.4~2.4835GHz (2.4GHz ISMBand)  |             |             |
| Channels                                     | Bluetooth Classic: Ch0~Ch78 (For 1MHzChannels);<br>Bluetooth Low Energy: Ch0~Ch39 (For 2MHzChannels); |             |             |
| PowerClasses                                 | Bluetooth Classic:Class1;<br>Bluetooth Low Energy:Class1.5;   |             |             |
| Data Rate &Modulation                        | BR_1Mbps:GFSK;<br>EDR_2Mbps:π/4-<br>DQPSK;EDR_3Mbps:8DP<br>SK;LE_1Mbps:GFSK;                          |             |             |
| Bluetooth Transmitter Specifications         |   |             |             |
| Items  | Min ( dBm )   | Typ ( dBm ) | Max ( dBm ) |
| <b>TXPower</b>                               |   |             |             |
| BR_1M TXPower                                | 2   | 5           | 8           |
| EDR_2/3M TXPower                             | 2   | 5           | 8           |
| LE_1M TXPower                                | 2   | 5           | 8           |
| <b>BR_1M(DH1) Modulation Characteristics</b> |   |             |             |
| Δf1avg                                       | 140KHz  | 166.26KHz   | 175KHz      |
| Δf2avg                                       | 115KHz  | 156.33KHz   | /           |

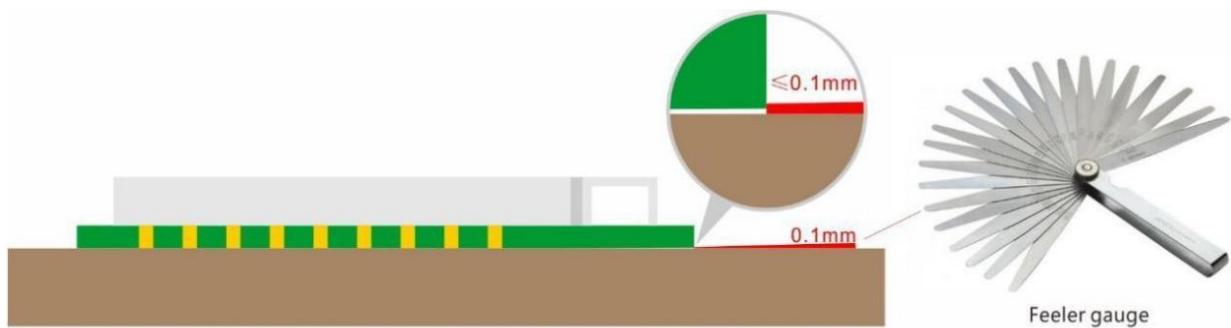
|   |                        |               |                           |              |
|---|------------------------|---------------|---------------------------|--------------|
| $\Delta f2_{max}$                       | 115KHz                 | 152.29KHz     | /                         |              |
| $\Delta f2_{avg}/\Delta f1_{avg}$       | 0.8                    | 1.09          | /                         |              |
| <b>EDR_3M(3DH5) ModulationAccuracy</b>  |                        |               |                           |              |
| 8DPSK RMSDEVM                           | /                      | 0.047         | 0.13                      |              |
| 8DPSKDEVM                               | /                      | 0.089         | 0.25                      |              |
| <b>LE_Modulationcharacteristics</b>     |                        |               |                           |              |
| $\Delta f1_{avg}$                       | 225kHz                 | 251.7kHz      | 275kHz                    |              |
| $\Delta f2_{avg}$                       | 185KHz                 | 241.2KHz      | 275kHz                    |              |
| $\Delta f2_{max}$                       | 185kHz                 | 244.7kHz      | /                         |              |
| $\Delta f2_{avg} / \Delta f1_{avg}$     | 0.8                    | 0.93          | /                         |              |
| <b>Bluetooth ReceiverSpecifications</b> |                        |               |                           |              |
| <b>Items</b>                            | <b>Sensitivity</b>     |               | <b>Maximum InputLevel</b> |              |
|   | <b>InputLevel(Typ)</b> | <b>BER</b>    | <b>InputLevel(Typ)</b>    | <b>BER</b>   |
| BR_1M(DH1)                              | -88dBm                 | $\leq 0.1\%$  | -20dBm                    | $\leq 0.1\%$ |
| EDR_3M(3DH5)                            | -82dBm                 | $\leq 0.01\%$ | -20dBm                    | $\leq 0.1\%$ |
| <b>Items</b>                            | <b>Sensitivity</b>     |               | <b>Maximum InputLevel</b> |              |
|   | <b>InputLevel(Typ)</b> | <b>PER</b>    | <b>InputLevel(Typ)</b>    | <b>PER</b>   |
| LE_1M                                   | -87dBm                 | $\leq 5\%$    | -20dBm                    | $\leq 5\%$   |

## 5. MechanicalSpecifications

### 5.1 Module OutlineDrawing

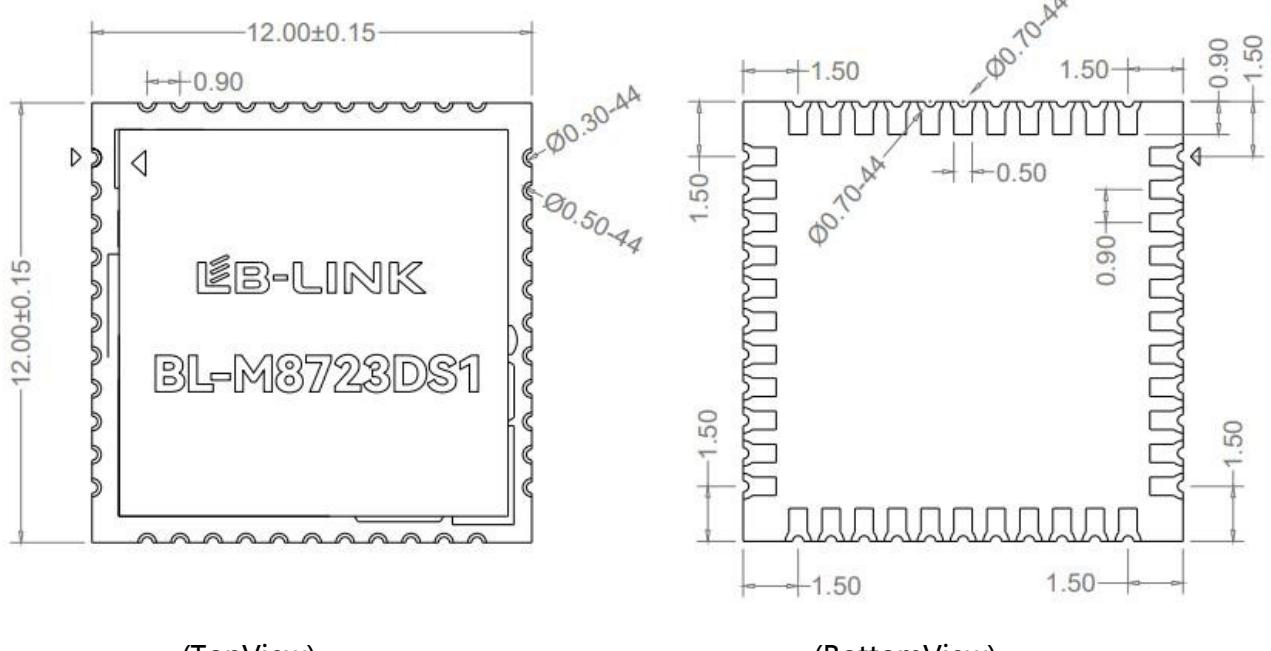


Module dimension: 12.0\*12.0\*2.1mm (L\*W\*H; Tolerance: $\pm 0.15$ mm)



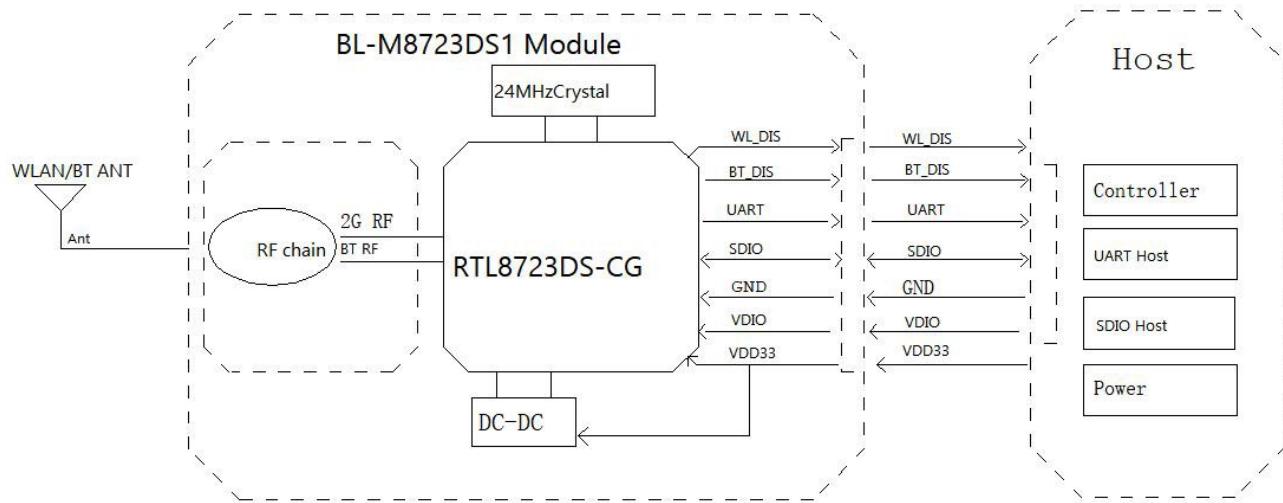
Module Bow andTwist :  $\leq 0.1\text{mm}$

## 5.2 MechanicalDimensions

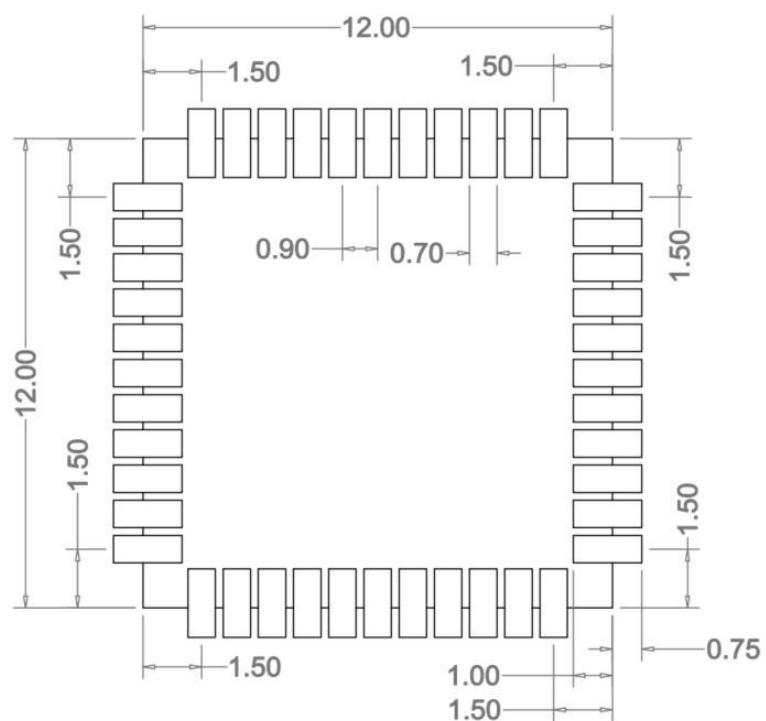


## 6. ApplicationInformation

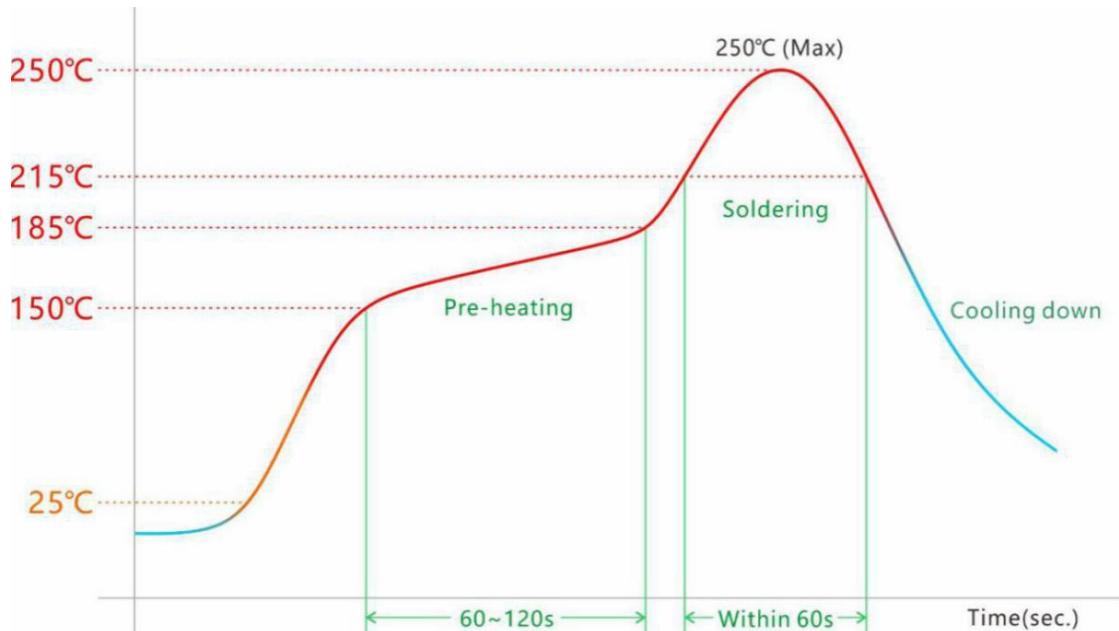
### 6.1 Typical ApplicationCircuit



### 6.2 Recommend PCB LayoutFootprint



### 6.3 Reflow Soldering Standard Conditions



Please use the reflow within 2times.

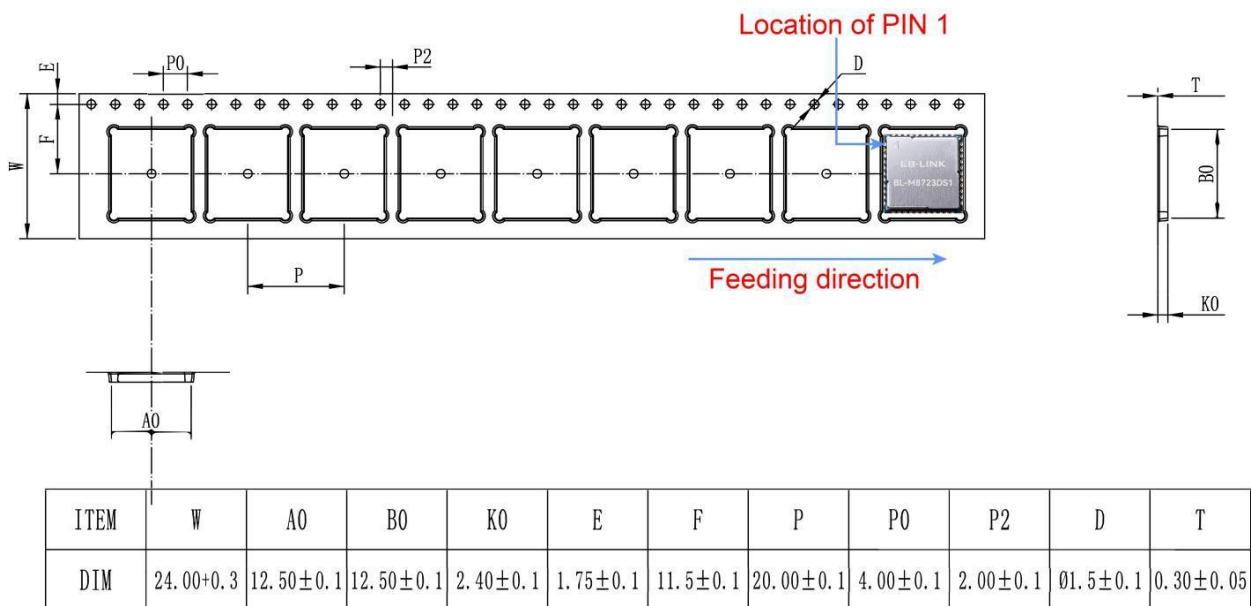
Set up the highest temperature within 250°C.

## 7. Key Components OfModule

| No. | Parts   | Specification | Manufacturer  | Note |
|-----|---------|---------------|---|------|
| 1   | Chipset | RTL8723DS-CG  | Realtek SemiconductorCorp.                                  |      |
| 2   | PCB     | BL-M8723DS1   | Huizhou DayawanKexiang Technology Circuit Board Co.,Ltd     |      |
|     |         |               | QuzhouSunlord ElectronicsCo.,Ltd                            |      |
|     |         |               | ShenZhen Tie Fa TechnologyLimited                           |      |
|     |         |               | SHEN ZHEN QILI ELECTRONCO.,LTD                              |      |
| 3   | Crystal | 24MHz-2520    | LUCKI CM ELECTRONICSCO.,LTD                                 |      |
|     |         |               | Chengde oscillator Electronic TechnologyCO.,LTD             |      |
|     |         |               | HUBEI TKD CRYSTAL ELECTRONIC<br>SCIENCEANDTECHNOLOGYCO.,LTD |      |

## 8. Package and StorageInformation

### 8.1 PackageDimensions



#### PackaPackage 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 humidity card in each anti-static vacuum bag.
5. Each carton is packed with 5 boxes.

## 8.2 StorageConditions

Absolute MaximumRatings:

Storage temperature: -40°C to +85°C

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

Recommended

StorageConditions:Storage

temperature: 5°C to +40°C Storage

humidity: 20% to 90%RH

Please use this Module within 12month aftervacuum-packaged.

The Module shall be stored without opening thepacking.

After the packing opened, the Module shall be used

within72hours.When the color of the humidity indicator in the packingchanged,The Module shall be baked beforesoldering.

Baking condition: 60°C, 24hours,1time.

ESDSensitivity :

ESD Protection: 2KV(HBM ,Maximumrating)

The Module is a static-sensitive electronicdevice.

Do not operate or store near strong electrostaticfields.Take proper ESDprecautio



**ESD CAUTION**

## **FCCStatement**

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.

### **§ 15.19 Labeling requirements.**

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.

### **§ 15.21 Information to user.**

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

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

### **FCC WARNING**

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

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.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

#### **15.105 Information to the user.**

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

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 equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20

cm between the radiator and your body. Radiation

Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This transmitter must not be co-located or operating in conjunction with any other

antenna or transmitter.

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination.

The firmware setting is not accessible by the end user.

The final end product must be labelled in a visible area with the following:

“Contains Transmitter Module [2BDDW-BLM8723DS1](#)”

**General Statements** The module is limited to OEM installation only. The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module. This module should be installed and operated with a minimum distance 20cm between the radiator and your body. OEM integrator shall equipped the antenna to compliance with antenna requirement part 15.203 & 15.204 and must not be co-located or operating in conjunction with any other antenna or transmitters. And OEM host shall implement a Class III Permissive Change (C2PC) or a new FCC ID to demonstrate complied with FCC standard. This module is for use with external antennas only, and the antenna is recommended as below:

| Antenna Information |              |           |              |                   |
|---------------------|--------------|-----------|--------------|-------------------|
| Model name          | Antenna Type | Connector | Max gain dBi | Application range |
| Aigain-WIFI         | PCB Antenna  | /         | 2.57dBi      | 2400-2500MHz      |

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the module. The OEM integrator is still responsible for testing the end-product for any additional compliance requirements required with this module installed. This module supports Bluetooth 2402-2480MHz & 2.4G WLAN 2412-2462MHz which complies with part 15.247. The product is typically used in industrial, household and general office/ITE and audio & video end-products.

## Requirement per KDB996369D03

### 2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.3

**Explanation:** This module meets the requirements of FCC part 15C(15.247). It specifically identified AC Power Line Conducted Emission, Radiated Spurious emissions, Band-edge and RF Conducted Spurious Emissions, Conducted Peak Output Power, Bandwidth, Power Spectral Density, Antenna Requirement.

### 2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

**Explanation:** The antenna can't be replaced by other authorized antennas, and the gain of each replacement antenna is no more than 2.57dBi. This module is limited to using antenna as below:

| Antenna Information |              |           |              |                   |
|---------------------|--------------|-----------|--------------|-------------------|
| Model name          | Antenna Type | Connector | Max gain dBi | Application range |
| Aigain-WIFI         | PCB Antenna  | /         | 2.57dBi      | 2400-2500MHz      |

## **2.4 Limited moduleprocedures**

**In accordance with 47CFR 15.212 Modular Transmitters and KDB 996369 D01 ‘Module Equip Auth Guide v02’. FCC ID 2BDDW-BLM8723DS1 cannot meet the integrated antenna and do not contain power supply regulation on the module.**

If a modular transmitter is approved as a “limited module,” then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions. A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

**Explanation:** The module is a limited single module. The module without an antenna and the module was not tested in stand-alone configuration – it was tested in the Host.

## **2.5 Trace antenna designs**

If trace antenna designs are applicable, full-detail design specifications are required per D02 Module Q&A Question 11.

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements. 4 a) Information that includes permitted variances (e.g., trace boundary limits,

thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);

- b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
- c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
- d) Appropriate parts by manufacturer and specifications;
- e) Test procedures for design verification; and
- f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

**Explanation: not applicable**

## **2.6 RF exposure considerations**

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information:

(1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end- product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

**Explanation:** This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body. "This module is designed to comply with the FCC statement, FCC ID is: [2BDDW- BLM8723DS1](#).

## **2.7 Antennas**

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also

identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an “omni-directional antenna” is not considered to be a specific “antenna type”)).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product.

The module manufacturers shall provide a list of acceptable unique connectors.

**Explanation:**

This module is limited used antenna as below:

| Antenna Infomation |              |           |              |                   |
|--------------------|--------------|-----------|--------------|-------------------|
| Model name         | Antenna Type | Connector | Max gain dBi | Application range |
| Aigain-WIFI        | PCB Antenna  | /         | 2.57dBi      | 2400-2500MHz      |

## **2.8 Label and compliance information**

Grantees are responsible for the continued compliance of their modules to the FCC rules. This

includes advising host product manufacturers that they need to provide a physical or e-label stating "Contains FCC ID" with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

**Explanation:** The host system using this module, should have a label in a visible area indicated the following texts: "Contains FCC ID: 2BDDW-BLM8723DS1.

## **2.9 Information on test modes and additional**

**testing requirements** Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.

**Explanation: Hangzhou Soundlive Electronic Co.,Ltd.**

can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

## **2.10 Additional testing, Part 15 Subpart B disclaimer**

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product

as being Part15

Subpart B compliant (when it also contains unintentional-radiatordigital circuity), then the grantee shall provide a notice stating that the finalhostproduct still requires Part 15 Subpart B compliance testing with themodular transmitterinstalled.

**Explanation:** The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. Thehostshoule be evaluated by the FCC SubpartB.

#### **OEM integrationinstructions:**

This device is intended only for OEM integrators under the followingconditions:

The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the conditions above are met, further transmitter test 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 (for example, digital device emissions, PC peripheral requirements, etc.).

#### **Validity of using the modulecertification:**

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module 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 productlabeling:**

The final end product must be labeled in a visible area with the following: "Contains Transmitter Module FCC ID: **2BDDW-BLM8723DS1**".

#### **Information that must be placed in the end usermanual:**

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.

The WFCO smart power control system gives the user control of devices throughout the RV, ranging from lights, to the water pump, to the awnings and slideouts. Whether using the APP through a smart device or using voice commands, the end user has complete control of their RV. The device is installed in the RV entrance, as shown in the drawing location 1.



The module is installed in the Power Pro Control System position 1 in the following figure.

The installation requirement is SMT mount. The antenna is in the picture position 2, and the distance between the antenna and the human body is greater than 20cm. The device is only used indoors.

