



**B-LINK®**

## **BL-M8723DU4**

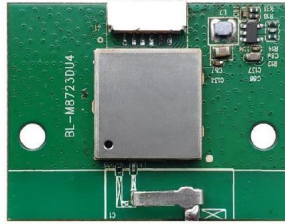
**802.11N 150Mbps WLAN+ Bluetooth 4.2**

**USB Module Specification**

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|   |       |
|---|-------|
| Module Name: BL-M8723DU4                                      |       |
| Module Type: 802.11b/g/n 1T1R WLAN + Bluetooth 4.2 USB Module |       |
| Revision: V1.0  |       |
| Customer Approval:  |       |
| Company:  |       |
| Title:  |       |
| Signature:  | Date: |
| LB-link Approval:   |       |
| Title:  |       |
| Signature:  | Date: |
|   |       |

**Revision History**

| Revision | Summary         | Release Date |
|----------|-----------------|--------------|
| 0.1      | Initial release | 2022-01-15   |
| 0.11     | Update the PCB  | 2022-03-31   |
| 1.0      | Final release   | 2022-04-20   |

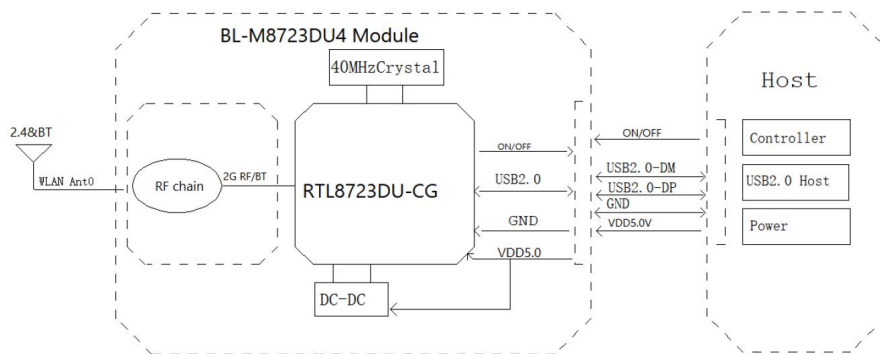
## 1. Introduction

BL-M8723DU4 is a highly integrated module built into 1 x 1 single wireless LAN and Bluetooth. Supports 1T1R WLAN baseband and RF. It supports IEEE802.11b/g/n standards and provides a maximum data rate up to 150Mbps, which can provide power-rich wireless connections and reliable throughput over long distances. Support Bluetooth 2.1/3.0/4.2.

### 1.1 Features

- Operating Frequencies: 2.4~2.4835GHz
- Host Interface is USB 2.0
- IEEE Standards: IEEE802.11 b/g/n
- Wireless data rate can reach up to 150Mbps
- Bluetooth 2.1/3.0/4.2
- Module built-in antenna
- Power Supply: VDD 5.0V±0.25V

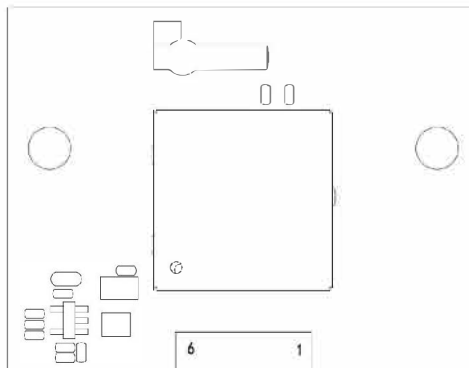
### 1.2 Block Diagram



### 1.3 General Specifications

|                       |  |
|-----------------------|--|
| Module Name           | BL-M8723DU4, WLAN+BT Combo Module  |
| Chipset               | RTL8723DU-CG   |
| WiFi Standards        | IEEE802.11b/g/n, 1T1R, 2.4G 150Mbps (Max)  |
| Bluetooth Standards   | V2.1/V4.2  |
| Host Interface        | USB2.0   |
| Antenna               | Module built-in antenna, max gain: 0.2dBi  |
| Dimension             | 40.0*31.0*6.30mm (L*W*H), Tolerance: +/-0.15mm                                     |
| Power Supply          | Voltage: DC 5.0V±0.25V<br>Standby Current: 80mA (Typ)<br>Work Current: 350mA (Max) |
| Operation Temperature | -20°C to +70°C   |
| Operation Humidity    | 10% to 95% RH (Non-Condensing)   |
| Storage Temperature   | -45°C to +85°C   |
| Storage Humidity      | 10% to 95% RH (Non-Condensing)   |
| System Supported      | Linux/Android/IOS/win7-win10   |

### 2. Pin Assignments





## 2.1 Pin Definition

| No | Pin Name | Type | Description  | Supply |
|----|----------|------|--|--------|
| 1  | VDD5.0   | --   | Power supply 5V is required (5.25V Max)  |        |
| 2  | USB_DM - | I/O  | USB data- (USB2.0)   |        |
| 3  | USB_DP + | I/O  | USB data+ (USB2.0)   |        |
| 4  | GND      | P    | Ground connection  |        |
| 5  | BT_WAKE  | I    | Wake up BT (Pull high to wake up and pull low to close)  |        |
| 6  | ON/OFF   | I    | "EN" Control of 5V TO 3.3V DC-DC (Internal pull High, VIH>1.2V, VIL<0.4V, Turn on Delay≤100ms) |        |

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 | -20    | 25   | 70  | °C    |   |
| Antenna gain                  | -      | 2.0  | -   | dBi   |   |
| Supply Voltage                | VDD5.0 | 4.75 | 5.0 | 5.25  | V |

### 3.2 Digital I/O DC Specifications

| Symbol | Parameter          | Min | Typ | Max | Units |
|--------|--------------------|-----|-----|-----|-------|
| VIH    | Input High Voltage | 2.0 | 3.3 | 3.6 | V     |
| VIL    | Input Low Voltage  | --  | 0   | 0.9 | V     |



### 3.3 Current Consumption

| Conditions : VDD5.0=5V ; Ta:25°C |                          |     |       |
|----------------------------------|--------------------------|-----|-------|
| Use Case                         | VDD5.0 Current (average) |     |       |
|                                  | Typ                      | Max | Units |
| WiFi Radio Off (Linux Driver)    | 76                       | 100 | mA    |
| WiFi Disable (Linux Driver)      | 75                       | --  | mA    |
| WiFi Unassociated (Linux Driver) | 78                       | 100 | mA    |
| WoWLAN(Linux Driver)             | 74                       | 100 | mA    |
| 2.4G 1Mbps TX (1RF-Test)         | 321                      | 335 | mA    |
| 2.4G 1Mbps RX (1RF-Test)         | 91                       | 98  | mA    |
| 2.4G 11Mbps TX (1RF-Test)        | 285                      | 300 | mA    |
| 2.4G 11Mbps RX (1RF-Test)        | 91                       | 98  | mA    |
| 2.4G 6Mbps TX (1RF-Test)         | 268                      | 278 | mA    |
| 2.4G 6Mbps RX (1RF-Test)         | 91                       | 98  | mA    |
| 2.4G MCS0(HT20) TX (1RF-Test)    | 250                      | 265 | mA    |
| 2.4G MCS0(HT20) RX (1RF-Test)    | 91                       | 98  | mA    |
| 2.4G MCS7(HT20) TX (1RF-Test)    | 187                      | 200 | mA    |
| 2.4G MCS7(HT20) RX (RF-Test)     | 91                       | 98  | mA    |
| 2.4G MCS0(HT40) TX (1RF-Test)    | 240                      | 260 | mA    |
| 2.4G MCS0(HT40) RX (1RF-Test)    | 91                       | 98  | mA    |
| 2.4G MCS7(HT40) TX (1RF-Test)    | 182                      | 190 | mA    |
| 2.4G MCS7(HT40) RX (1RF-Test)    | 91                       | 98  | mA    |

## 4. Interface Timing Specifications

### 4.1 USB Bus during power on Sequence

#### 7.1. USB Bus during Power On Sequence



Figure 4. RTL8723DU USB Bus Power On Sequence

$T_{on}$ : The main power ramp up duration  
 $T_{pwr}$ : The power on reset releases and power management unit executes power on tasks  
 $T_{attach}$ : USB attach state  
 $T_{hostate}$ : the duration from register attached to USB host starting card detection procedure

**The power on flow description:**

After main 3.3V ramp up, the internal power on reset is released by power ready detection circuit and the power management unit will be enabled. The power management unit enables the internal regulator and clock circuits.

The power management unit also enables the USB circuits.

USB analog circuits attach resistors to indicate the insertion of the USB device

Table 14. The typical timing range

|               | Unit | Min | Typical | Max |
|---------------|------|-----|---------|-----|
| $T_{on}$      | ms   | 0.2 | 1.5     | 5   |
| $T_{pwr}$     | ms   | --  | 2       | 10  |
| $T_{attach}$  | ms   | 2   | 7       | 15  |
| $T_{hostate}$ | ms   | 50  | 250     | --  |

### 4.2 Throughput Test

| Mode                            | Supported mode | T/R(Mbps) | Mbps       |
|---------------------------------|----------------|-----------|------------|
| AP Mode for 2.4G                | Supported      | 40Mbps    | --         |
| STA Mode for 2.4G               | Supported      | 60Mbps    | --         |
| AP+STA Concurrent mode for 2.4G | Supported      | AP 20Mbps | STA 30Mbps |



## 5. WiFi & Bluetooth RF Specification

### 5.1 2.4G WiFi RF Specification

| Conditions: VDD5.0=5V; Ta:25°C  |   |                      |        |
|---------------------------------|---|----------------------|--------|
| Features                        | Description   |                      |        |
| WLAN Standard                   | IEEE 802.11b/g/n  |                      |        |
| Frequency Range                 | 2.4~2.4835GHz (2.4GHz ISM Band)   |                      |        |
| Modulation                      | 802.11b DSSS: CCK, DQPSK, DBPSK<br>802.11g OFDM: 64QAM, 16QAM, QPSK, BPSK<br>802.11n OFDM: 64QAM, 16QAM, QPSK, BPSK                                   |                      |        |
| Date Rate                       | 802.11b: 1, 2, 5.5, 11Mbps,<br>802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps,<br>802.11n-HT20: MCS0~7, 6.5~72.2Mbps,<br>802.11n-HT40: MCS0~7, 13~150Mbps, |                      |        |
| Frequency Tolerance             | ≤ ±20ppm  |                      |        |
| 2.4G Transmitter Specifications |   |                      |        |
| TX Rate                         | TX Power  | TX Power Tolerance   | EVM    |
| 802.11b@1~11Mbps                | 17dBm   | ±2.0dBm              | ≤-10dB |
| 802.11g@6Mbps                   | 14dBm   | ±2.0dBm              | ≤-10dB |
| 802.11g@54Mbps                  | 14dBm   | ±2.0dBm              | ≤-25dB |
| 802.11n@HT20_MCS0               | 14dBm   | ±2.0dBm              | ≤-10dB |
| 802.11n@HT20_MCS7               | 14dBm   | ±2.0dBm              | ≤-28dB |
| 802.11n@HT40_MCS0               | 14dBm   | ±2.0dBm              | ≤-10dB |
| 802.11n@HT40_MCS7               | 14dBm   | ±2.0dBm              | ≤-28dB |
| 2.4G Receiver Specifications    |   |                      |        |
| RX Rate                         | Min Input Level(Typ)  | Max Input Level(Typ) | PER    |
| 802.11b@1Mbps                   | -88dBm  | -10dBm               | < 8%   |
| 802.11b@11Mbps                  | -79dBm  | -10dBm               | < 8%   |
| 802.11g@6Mbps                   | -82dBm  | -20dBm               | < 10%  |
| 802.11g@54Mbps                  | -65dBm  | -20dBm               | < 10%  |
| 802.11n@HT20_MCS0               | -82dBm  | -20dBm               | < 10%  |
| 802.11n@HT20_MCS7               | -64dBm  | -20dBm               | < 10%  |
| 802.11n@HT40_MCS0               | -79dBm  | -20dBm               | < 10%  |
| 802.11n@HT40_MCS7               | -61dBm  | -20dBm               | < 10%  |





### 5.2 2.4G Authentication Channel Distribution

| Regulation Domain<br>(mib regdomain value) | Supported Channels               |
|--|----------------------------------|
| FCC  | 1,2,3,4,5,6,7,8,9,10,11          |
| IC   | 1,2,3,4,5,6,7,8,9,10,11          |
| ETSI                                       | 1,2,3,4,5,6,7,8,9,10,11,12,13    |
| MKK  | 1,2,3,4,5,6,7,8,9,10,11,12,13,14 |

### 5.3 Bluetooth RF Specification

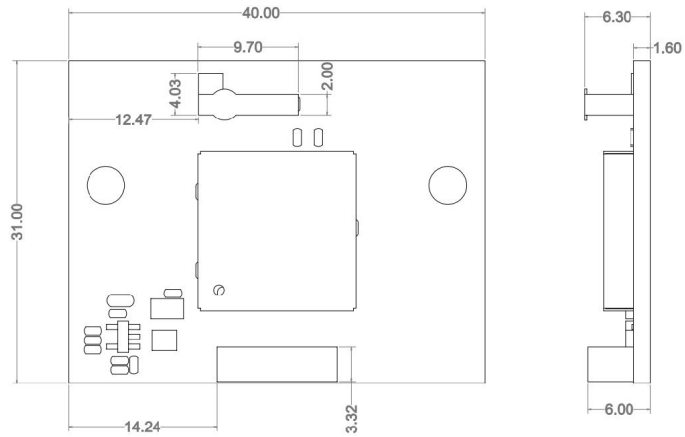
| Conditions: VDD5.0=5V; Ta:25°C       |   |        |        |
|--------------------------------------|---|--------|--------|
| Features                             | Description   |        |        |
| Bluetooth Specification              | Bluetooth v2.1+EDR/3.0+HS (Bluetooth Classic _ BT BR/EDR), Bluetooth 4.2                                |        |        |
| Frequency Range                      | 2.4~2.4835GHz (2.4GHz ISM Band)   |        |        |
| Channels                             | Bluetooth Classic: Ch0~Ch78 (For 1MHz Channels);<br>Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels); |        |        |
| Power Classes                        | Bluetooth Classic: Class1;<br>Bluetooth Low Energy: Class1.5;   |        |        |
| Date Rate & Modulation               | BR_1Mbps: GFSK;<br>EDR_2Mbps: $\pi/4$ -DQPSK;<br>EDR_3Mbps: 8DPSK;<br>LE_1Mbps: GFSK (Uncoded);         |        |        |
| Bluetooth Transmitter Specifications |   |        |        |
| Items                                | Min   | Typ    | Max    |
| TX Power                             |   |        |        |
| BR_1M TX Power                       | 0   | 4      | 8      |
| EDR_2/3M TX Power                    | 0   | 4      | 8      |
| LE_1M TX Power                       | 0   | 4      | 8      |
| BR_1M Modulation Characteristics     |   |        |        |
| $\Delta f_{avg}$                     | 140kHz  | 157kHz | 175kHz |
| $\Delta f_{2max}$                    | 115kHz  | 145kHz | --     |



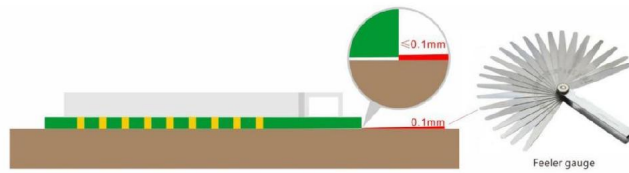
|   |                  |               |                     |              |
|---|------------------|---------------|---------------------|--------------|
| [For at least 99.9% of all $\Delta f_{2max}$ ]                              |                  |               |                     |              |
| $\Delta f_{2avg} / \Delta f_{1avg}$   | 0.8              | 0.98          |                     | --           |
| <b>EDR Modulation Accuracy</b>  |                  |               |                     |              |
| RMS DEVM (EDR_2M)   | --               | 8%            |                     | 20%          |
| 99% DEVM (EDR_2M)   | --               | 11%           |                     | 30%          |
| Peak DEVM (EDR_2M)  | --               | 15%           |                     | 35%          |
| RMS DEVM (EDR_3M)   | --               | 8%            |                     | 13%          |
| 99% DEVM (EDR_3M)   | --               | 11%           |                     | 20%          |
| Peak DEVM (EDR_3M)  | --               | 15%           |                     | 25%          |
| <b>LE Modulation characteristics</b>  |                  |               |                     |              |
| $\Delta f_{1avg}$ (LE_1M)   | 225kHz           |               |                     | 275kHz       |
| $\Delta f_{2max}$<br>[For at least 99.9% of all $\Delta f_{2max}$ ] (LE_1M) | 185kHz           | --            |                     | --           |
| $\Delta f_{2avg} / \Delta f_{1avg}$ (LE_1M)                                 | 0.8              | 0.98          |                     | --           |
| <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  | -88dBm           | $\leq 0.01\%$ | -20dBm              | $\leq 0.1\%$ |
| LE_1M   | -90dBm           | $\leq 30.8\%$ | -20dBm              | $\leq 0.1\%$ |

## 6. Mechanical Specifications

### 6.1 Module Outline Drawing

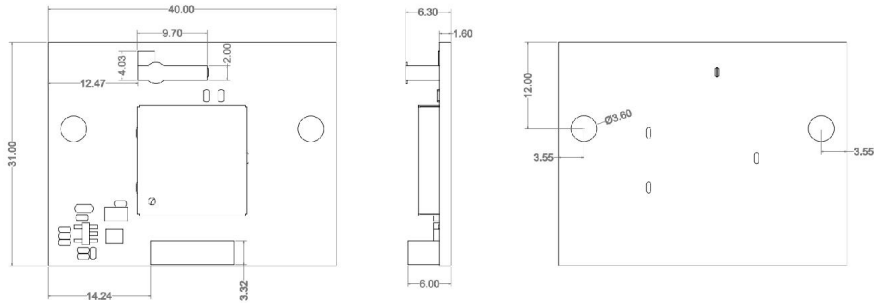


Module dimension: 40.0\*31.0\*6.30mm (L\*W\*H; Tolerance:  $\pm 0.15$ mm)



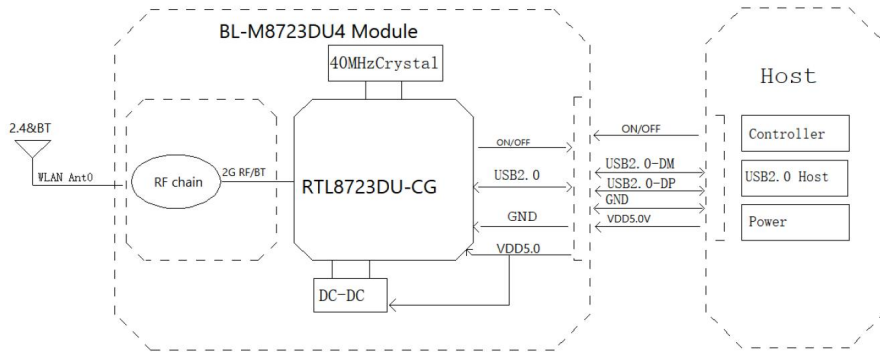
Module Bow and Twist:  $\leq 0.1$ mm

**6.2 Mechanical Dimensions**

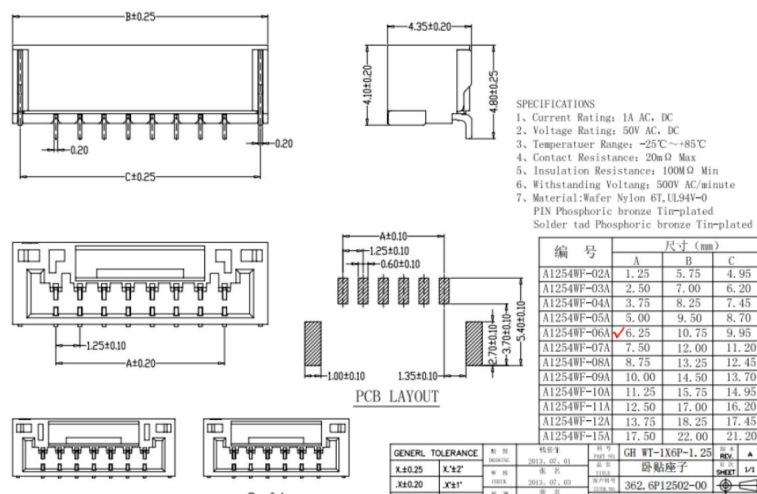


**7. Application Information**

**7.1 Typical Application Circuit**



## 7.2 Connector Specification



## 8. Key Components Of Module

| No. | Parts   | Specification | Manufacturer  | Note |
|-----|---------|---------------|---|------|
| 1   | Chipset | RTL8723DU-CG, | Realtek   |      |
| 2   | PCB     | BL-M8723DU4   | Shen Zhen Tie Fa Technology limited   |      |
|     |         |               | MILLION SOURCE PRINTED CIRCUIT BOARD CO., LTD   |      |
|     |         |               | Quzhou Sunlord Electronics Co., Ltd   |      |
| 3   | Crystal | 40MHz-3225    | Lucki Electronics Co., Ltd  |      |
|     |         |               | Shenzhen Kaiyuexiang Electronics Co., Ltd<br>Chengde Oscillator Electronic Technology Co., Ltd. |      |
| 4   | PMIC    | SOT23-5       | TMI   |      |
|     |         |               | SILERGY   |      |

## 9. Package and Storage Information

### 9.1 Package Dimensions



Package specification:

1. 24 modules per blister plate and 288 modules per box.
2. The blister is bound with wire membrane and put into anti-static vacuum bag.
3. Put 1 bag of dry beads (20g) in each anti-static vacuum bag. 1 pcs 3 point humidity card.
4. The outer box size is 35.2\*21.5\*15.5cm.

### 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 use.

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

**ESD Sensitivity:**

ESD Protection: 4KV(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**

## **FCC Statement**

This device 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 device 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 device does cause harmful interference to radio or television reception, which can be determined by turning the device 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 device and receiver.
- Connect the device 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

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

The antennas 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 for operating in conjunction with any other antenna or transmitter.

This device complies with Part 15 of the FCC Rules and contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). 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

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains FCC ID: 2AL6K-BL-M8723DU4" any similar wording that expresses the same meaning may be used.

The ISED certification label of a module shall be always clearly visible when installed in the host product; otherwise, the host product must be labelled to display the ISED certification number for the module, preceded by the word "contains" or similar wording expressing the same meaning, as follows: Contains IC: 20944-BLM8723DU4

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.

Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes : (1) Cet appareil ne doit pas causer d'interférences. (2) Cet appareil doit accepter toutes les interférences, y compris celles susceptibles de provoquer un fonctionnement indésirable de l'appareil