



# **BL-M6355XU1**

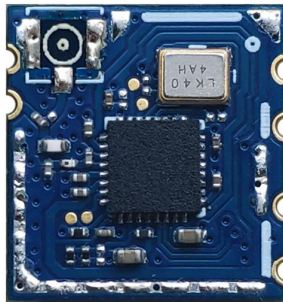
**802.11ax 229Mbps WLAN+BLE v5.0**

**USB Module Specification**

**SHENZHEN BILIAN ELECTRONIC CO., LTD**

Add: 10~11/F, Building 1A, Huaqiang idea park, Guangming district, Shenzhen. Guangdong, China

Web: [www.b-link.net.cn](http://www.b-link.net.cn)



( Top View )



( Bottom View )

Module Name: BL-M6355XU1

Module Type: 802.11b/g/n/ax 229Mbps WLAN+BLE v5.0 Combo USB Module

Revision: V1.0

Customer Approval:

Company:

Title:

Signature:

Date:

LB-link Approval:

Title:

Signature:

Date:

## Revision History

| Revision | Summary          | Release Date | Revised By |
|----------|------------------|--------------|------------|
| 1.0      | Official release | 2024-02-20   | Garry      |
|          |                  |              |            |
|          |                  |              |            |
|          |                  |              |            |

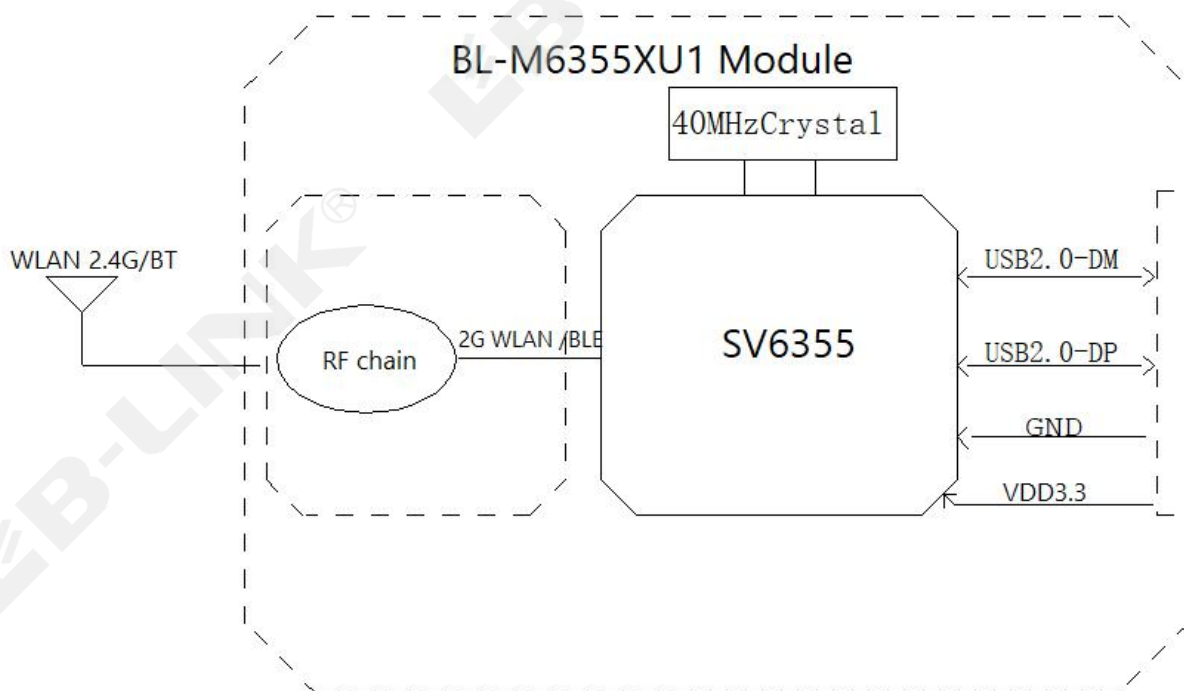
## 1. Introduction

BL-M6355XU1 is a highly integrated Single-band WLAN + BLE Combo module base on SV6355, which combines with 2.4G 1T1R WLAN, Bluetooth Low Energy, MCU and RAM, USB interface in single chip. The module compatible IEEE802.11b/g/n/ax standard and supports Bluetooth Low Energy with BT v5.0 compliant, offering feature-rich wireless connectivity at high standards, delivering reliable, cost-effective and high throughput from an extended distance.

### 1.1 Features

- Operating Frequency: 2.4~2.4835GHz
- Compatible IEEE 802.11b/g/n/ax
- Support 802.11ax 20/40MHz bandwidth with MCS9, Max PHY rate up to 229Mbps
- Compatible Bluetooth core specification v5.0, supports BLE only
- Host interface is USB2.0
- 3.3V±0.2V single power supply

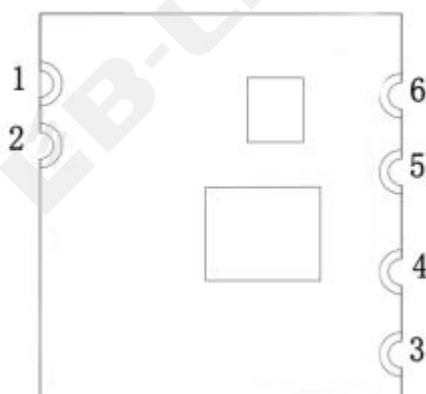
### 1.2 Block Diagram



## 1.3 General Specifications

|                       |                                                       |
|-----------------------|-------------------------------------------------------|
| Module Name           | BL-M6355XU1                                           |
| Chipset               | SV6355                                                |
| WLAN Standards        | IEEE802.11b/g/n/ax                                    |
| BT Specification      | Bluetooth Low Energy v5.0                             |
| Host Interface        | USB 2.0                                               |
| Antenna               | Connect to the external antenna through half hole pad |
| Dimension             | 13.0*12.3*1.7mm (L*W*H)                               |
| Power Supply          | DC 3.3±0.2V@ 700 mA (Max )                            |
| Operation Temperature | -20°C to +70°C                                        |
| Operation Humidity    | 10% to 95% RH (Non-Condensing)                        |

## 2.Pin Assignments



(Top View)

### 2.1 Pin Definition

| No. | Pin Name  | Type  | I/O Level | Module Pin Description                        |
|-----|-----------|-------|-----------|-----------------------------------------------|
| 1   | GND       | RF    |           | RF Ground for ANT                             |
| 2   | ANT       | RF    |           | 2.4G WLAN / RF PAD for external ANT           |
| 3   | VDD3.3    | P     |           | DC 3.3V Power Supply                          |
| 4   | USB2.0_DM | A I/O |           | USB2.0 Transmitter/Receiver Differential Pair |
| 5   | USB2.0_DP | A I/O |           | USB2.0 Transmitter/Receiver Differential Pair |

|   |     |   |  |                                                        |
|---|-----|---|--|--------------------------------------------------------|
| 6 | GND | P |  | Ground connections for power and USB Differential Pair |
|---|-----|---|--|--------------------------------------------------------|

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

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

## 3. Electrical and Thermal Specifications

### 3.1 Recommended Operating Conditions

| Parameters                    |        | Min | Typ | Max | Units |
|-------------------------------|--------|-----|-----|-----|-------|
| Ambient Operating Temperature |        | -20 | 25  | 70  | °C    |
| External Antenna VSWR         |        | -   | 1.7 | 2   | /     |
| Supply Voltage                | VDD3.3 | 3.1 | 3.3 | 3.5 | V     |

### 3.2 Current Consumption

| Conditions : VDD3.3=3.3V ; Ta:25°C                |                        |                         |       |
|---------------------------------------------------|------------------------|-------------------------|-------|
| Use Case                                          | VDD3.3 Current         |                         |       |
|                                                   | Typ(I <sub>RMS</sub> ) | Max(I <sub>Peak</sub> ) | Units |
| WLAN Unassociated (Linux Driver)                  | 121                    | 144                     | mA    |
| 2.4G WLAN 229Mbps Web browsing (Linux Driver)     | 214                    | 362                     | mA    |
| 2.4G WLAN TCP throughput TX 120Mbps (Linux Drive) | 283                    | 418                     | mA    |
| 2.4G WLAN TCP throughput RX 140Mbps (Linux Drive) | 186                    | 410                     | mA    |
| 2.4G 11b@1Mbps TX @17dBm (TX RF test)             | 349                    | 392                     | mA    |
| 2.4G 11b@11Mbps TX@17dBm (TX RF test)             | 302                    | 364                     | mA    |
| 2.4G 11g@6Mbps TX@17dBm (TX RF test)              | 299                    | 376                     | mA    |
| 2.4G 11g@54Mbps TX@16dBm (TX RF test)             | 223                    | 352                     | mA    |
| 2.4G 11n@HT20_MCS0 TX@17dBm (TX RF test)          | 314                    | 384                     | mA    |
| 2.4G 11n@HT20_MCS7 TX@15dBm (TX RF test)          | 260                    | 352                     | mA    |
| 2.4G 11ax@HE_SU20_MCS0 TX@16dBm (TX RF test)      | 308                    | 496                     | mA    |
| 2.4G 11ax@HE_SU20_MCS0 RX (TX RF test)            | 123                    | 144                     | mA    |
| 2.4G 11ax@HE_SU20_MCS9 TX@13dBm (TX RF test)      | 270                    | 400                     | mA    |

|                                              |     |     |    |
|----------------------------------------------|-----|-----|----|
| 2.4G 11ax@HE_SU40_MCS0 TX@16dBm (TX RF test) | 306 | 496 | mA |
| 2.4G 11ax@HE_SU40_MCS9 TX@13dBm (TX RF test) | 290 | 456 | mA |
| 2.4G 11ax@HE_SU40_MCS9 RX (TX RF test)       | 125 | 144 | mA |
| BLE 1M TX(RF-Test) 5dBm                      | 149 | 200 | mA |
| BLE 1M RX(RF-Test)                           | 120 | 144 | mA |
| BLE 2M TX(RF-Test) 5dBm                      | 156 | 200 | mA |
| BLE 2M RX(RF-Test)                           | 119 | 144 | mA |

## 4.WLAN & Bluetooth RF Specifications

### 4.1 2.4G WLAN RF Specification

| Conditions : VDD3.3=3.3V ; Ta:25°C                                                                                                                                                                                                                           |                                   |                                                                                                                                                                                                                                                                                                                                                      |         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Features                                                                                                                                                                                                                                                     |                                   | Description                                                                                                                                                                                                                                                                                                                                          |         |
| WLAN Standard                                                                                                                                                                                                                                                |                                   | IEEE 802.11b/g/n/ax                                                                                                                                                                                                                                                                                                                                  |         |
| Frequency Range                                                                                                                                                                                                                                              |                                   | 2.4~2.4835GHz (2.4GHz ISM Band)                                                                                                                                                                                                                                                                                                                      |         |
| Channels                                                                                                                                                                                                                                                     |                                   | Ch1~Ch13 (For 20MHz Channels)                                                                                                                                                                                                                                                                                                                        |         |
| Modulation                                                                                                                                                                                                                                                   |                                   | 802.11b (DSSS): DBPSK, DQPSK, CCK;<br>802.11g (OFDM): BPSK, QPSK, 16QAM, 64QAM;<br>802.11n (OFDM): BPSK, QPSK, 16QAM, 64QAM;<br>802.11ax (OFDMA): BPSK, BPSK_DCM, QPSK, QPSK_DCM, QAM16, QAM16_DCM, QAM64, QAM256                                                                                                                                    |         |
| Data Rate                                                                                                                                                                                                                                                    |                                   | 802.11b: 1, 2, 5.5, 11Mbps;<br>802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps;<br>802.11n (HT20) MCS0~MCS7: 6.5~72.2Mbps;<br>802.11n (HT40) MCS0~MCS7: 13.5~150Mbps;<br>802.11ax (HE_MU,26~242RU) MCS0~MCS9: 0.4~114.7Mbps;<br>802.11ax (HE_SU, non-OFDMA 20MHz) MCS0~MCS9: 3.6~114.7Mbps;<br>802.11ax (HE_SU, non-OFDMA 40MHz) MCS0~MCS9: 7.3~229.4Mbps; |         |
| Frequency Tolerance                                                                                                                                                                                                                                          |                                   | ≤ ±20ppm                                                                                                                                                                                                                                                                                                                                             |         |
| 2.4G Transmitter Specifications (TX power tolerance calibrated, customers can define the target TX power by modifying configuration file of the driver software. Customers must define the TX power same or lower than recommended Target TX Power as below) |                                   |                                                                                                                                                                                                                                                                                                                                                      |         |
| TX Rate                                                                                                                                                                                                                                                      | Recommended Target TX Power (dBm) | TX Power Tolerance (dBm)                                                                                                                                                                                                                                                                                                                             | EVM(dB) |
| 802.11b@1Mbps                                                                                                                                                                                                                                                | 17                                | ±2                                                                                                                                                                                                                                                                                                                                                   | ≤-10    |

|                         |    |    |      |
|-------------------------|----|----|------|
| 802.11b@11Mbps          | 17 | ±2 | ≤-10 |
| 802.11g@6Mbps           | 17 | ±2 | ≤-10 |
| 802.11g@54Mbps          | 16 | ±2 | ≤-25 |
| 802.11n@HT20_MCS0       | 17 | ±2 | ≤-10 |
| 802.11n@HT20_MCS7       | 15 | ±2 | ≤-28 |
| 802.11n@HT40_MCS0       | 17 | ±2 | ≤-10 |
| 802.11n@HT40_MCS7       | 15 | ±2 | ≤-28 |
| 802.11ax@HE_SU 20M_MCS0 | 16 | ±2 | ≤-15 |
| 802.11ax@HE_SU 20M_MCS9 | 13 | ±2 | ≤-32 |
| 802.11ax@HE_SU 40M_MCS0 | 16 | ±2 | ≤-15 |
| 802.11ax@HE_SU 40M_MCS9 | 13 | ±2 | ≤-32 |

#### 2.4G Receiver Specifications

| RX Rate                 | Min Input Level (Typ, dBm) | Max Input Level (Typ, dBm) | PER   |
|-------------------------|----------------------------|----------------------------|-------|
| 802.11b@1Mbps           | -93                        | -10                        | < 8%  |
| 802.11b@11Mbps          | -85                        | -10                        | < 8%  |
| 802.11g@6Mbps           | -87                        | -10                        | < 10% |
| 802.11g@54Mbps          | -72                        | -10                        | < 10% |
| 802.11n@HT20_MCS0       | -88                        | -10                        | < 10% |
| 802.11n@HT20_MCS7       | -69                        | -10                        | < 10% |
| 802.11n@HT40_MCS0       | -85                        | -10                        | < 10% |
| 802.11n@HT40_MCS7       | -67                        | -10                        | < 10% |
| 802.11ax@HE_SU 20M_MCS0 | -86                        | -10                        | < 10% |
| 802.11ax@HE_SU 20M_MCS9 | -64                        | -10                        | < 10% |
| 802.11ax@HE_SU 40M_MCS0 | -84                        | -10                        | < 10% |
| 802.11ax@HE_SU 40M_MCS9 | -60                        | -10                        | < 10% |

## 4.2 Bluetooth RF Specification

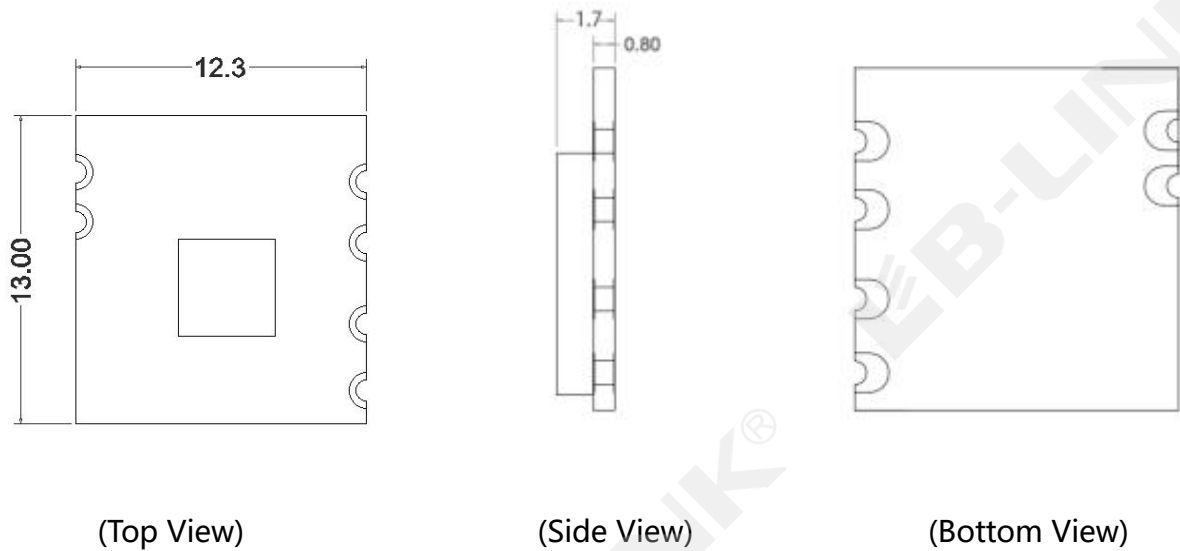
Conditions: VDD3.3=3.3V; Ta:25°C

| Features                | Description                                         |
|-------------------------|-----------------------------------------------------|
| Bluetooth Specification | Bluetooth v5.0 Low Energy                           |
| Frequency Range         | 2.4~2.4835GHz (2.4GHz ISM Band)                     |
| Channels                | Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels); |

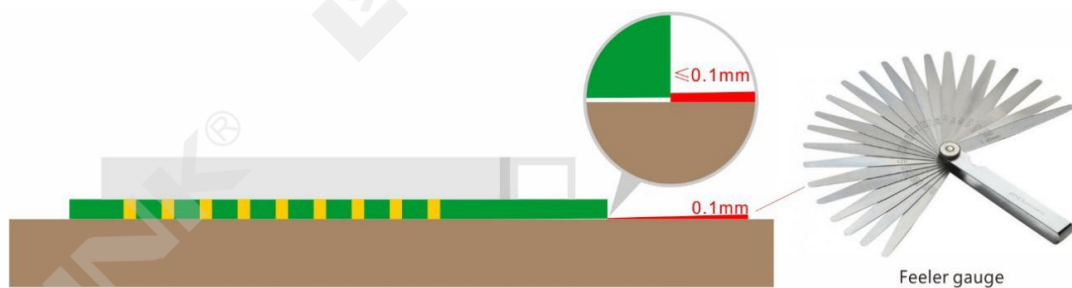
|                                      |                                                                                                                          |           |                     |      |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------|---------------------|------|
| Power Classes                        | Bluetooth Low Energy: Class1.5;                                                                                          |           |                     |      |
| Data Rate & Modulation               | LE_125Kbps: GFSK (Coded_S=8);<br>LE_500Kbps: GFSK (Coded_S=2);<br>LE_1Mbps: GFSK (Uncoded);<br>LE_2Mbps: GFSK (Uncoded); |           |                     |      |
| Bluetooth Transmitter Specifications |                                                                                                                          |           |                     |      |
| Items                                | Min                                                                                                                      | Typ       | Max                 |      |
| TX Power                             |                                                                                                                          |           |                     |      |
| BLE 1M/2M                            | 2dBm                                                                                                                     | 5dBm      | 8dBm                |      |
| BLE 125K/500K                        | 2dBm                                                                                                                     | 5dBm      | 8dBm                |      |
| Items                                | Min                                                                                                                      | Typ       | Max                 |      |
| BLE_1M Modulation Characteristics    |                                                                                                                          |           |                     |      |
| Δf1avg                               | 225KHz                                                                                                                   | 249.60KHz | 275KHz              |      |
| Δf2avg                               | 185KHz                                                                                                                   | 231.08KHz | /                   |      |
| Δf2max                               | 185KHz                                                                                                                   | 226.10KHz | /                   |      |
| Δf2avg/Δf1avg                        | 0.8                                                                                                                      | 0.92      | /                   |      |
| Items                                | Min                                                                                                                      | Typ       | Max                 |      |
| BLE_2M Modulation Characteristics    |                                                                                                                          |           |                     |      |
| Δf1avg                               | 450KHz                                                                                                                   | 500KHz    | 550KHz              |      |
| Δf2avg                               | 370KHz                                                                                                                   | 510KHz    | /                   |      |
| Δf2max                               | 370KHz                                                                                                                   | 488KHz    | /                   |      |
| Δf2avg/Δf1avg                        | 0.8                                                                                                                      | 1.02      | /                   |      |
| Bluetooth Receiver Specifications    |                                                                                                                          |           |                     |      |
| Items                                | Sensitivity                                                                                                              |           | Maximum Input Level |      |
|                                      | Input Level(Typ)                                                                                                         | PER       | Input Level(Typ)    | PER  |
| BLE_125/500K                         | -92dBm                                                                                                                   | ≤ 5%      | -5dBm               | ≤ 5% |
| BLE_1M                               | -88dBm                                                                                                                   | ≤ 5%      | -5dBm               | ≤ 5% |
| BLE_2M                               | -84dBm                                                                                                                   | ≤ 5%      | -5dBm               | ≤ 5% |

## 5. Mechanical Specifications

### 5.1 Module Outline Drawing

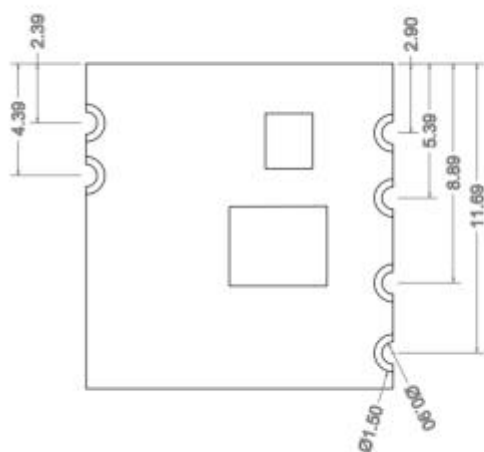


Module dimension: 13.0\*12.3\*1.7mm(L\*W\*H; Tolerance:  $\pm 0.3\text{mm}_L/W$ ,  $\pm 0.2\text{mm}_H$ )

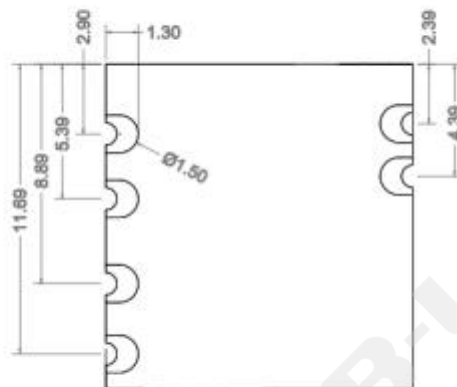


Module Bow and Twist:  $\leq 0.1\text{mm}$

## 5.2 Mechanical Dimensions



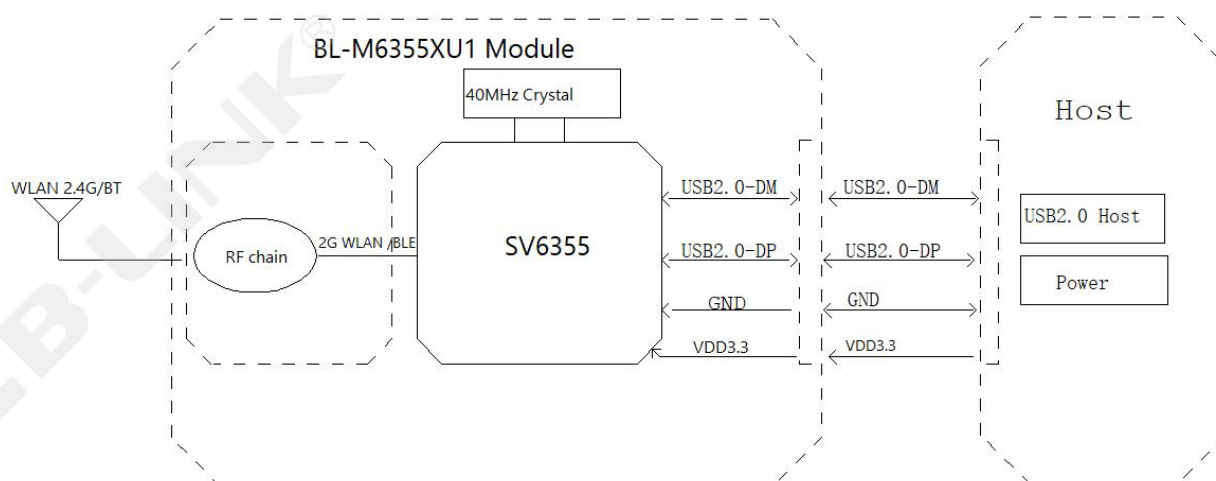
(Top View)



(Bottom View)

## 6. Application Information

### 6.1 Typical Application Circuit



## 6.2 HW Application Note

The module uses general packaging of USB\_13\*12.3mm, which has the defect that GND Pins are too far away from RF/USB/Power Pins. Therefore, in the application of RF from half hole PAD, the power loop may interfere with the RF loop and cause RF performance derating, customers must be careful to design RF, USB and Power circuits of the module on their motherboard!

### 6.2.1 VDD33 Power requirement:

- A、DC 3.1~3.5V & Ripple Voltage <100mV power supply input, Maximum RMS current $\geq$ 0.5A and Maximum Peak current $\geq$ 0.7A.
- B、For achieve fast transient response, a current mode buck converter recommended.
- C、On customer's motherboard, use 10uF and 100nF MLCC capacitors close to the module's VDD33 Pin for power input decoupling. Each GND Pin has three close vias to ensure connectivity and thermal conductivity.

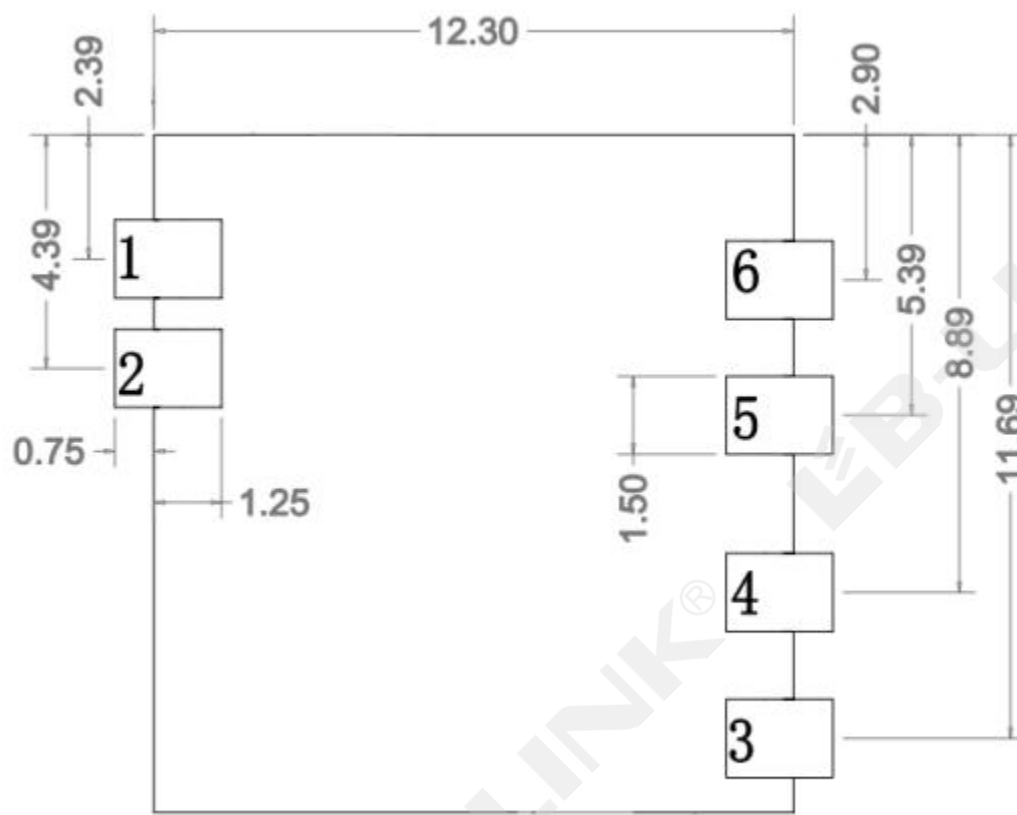
### 6.2.2 USB interface Design Guidelines:

- A、The module provides a USB device interface which is compatible with USB2.0 specification, High-Speed mode supports data transmission rate up to 480Mbps.
- B、On customer's motherboard, PCB traces of the USB high-speed signal pair should be maintain 90 $\Omega$  differential impedance, structure of "Differential Coated Coplanar Waveguide With Ground" with the advantages of impedance control and GND surrounding isolation interference may be an ideal choice. To avoid interference, USB signal pair must be far away from power, RF and other signals, GND copper can be used to surround and isolate them.
- C、PCB traces of the USB high-speed signal pair as short as possible, as far away from other signal as possible, minimize the length mismatch of signal pair, avoid layer change and maintain a complete reference layer to reduces signal reflections and impedance changes.
- D、If It is necessary to change layers for USB signal pair routing, use GND vias close to signal pair's vias as the shortest return path.

### 6.2.3 RF Path Design Guidelines:

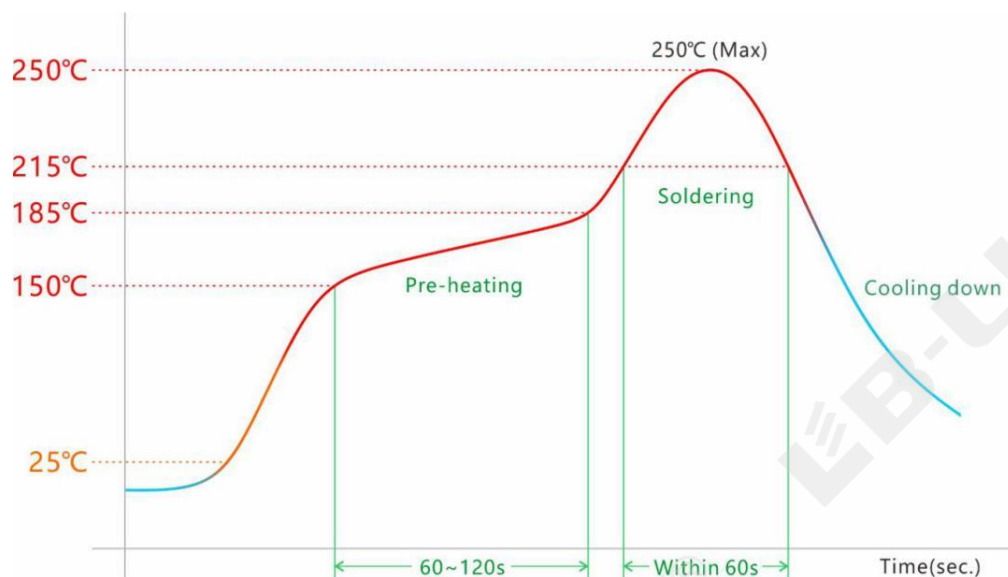
- A、On customer's motherboard, keep complete GND copper area under and around the module, do not route Power, RF, USB and other signals there to avoid interfering with the module causing RF performance derating problem.
- B、PCB traces of the RF path as short as possible, as far away from other signal as possible, avoid layer change, and should be maintain continuous 50 $\Omega$  characteristic impedance, structure of "Coated Coplanar Waveguide With Ground" with the advantages of impedance control and GND surrounding isolation interference may be an ideal choice. It is necessary to maintain a complete GND reference layer below the RF path area.
- C、RF Pin and antenna PAD/RF connector PAD on customer's motherboard are significantly wider than PCB traces of the RF path, which will cause RF impedance discontinuity. To improve this problem, in addition to adjusting the local impedance of these PADs, a " $\pi$ " circuit can be reserved near the antenna/RF connector which can match both RF path impedance and antenna impedance.

### 6.3 Recommend PCB Layout Footprint



(Design Unit: mm)

## 6.4 Reflow Soldering Standard Conditions



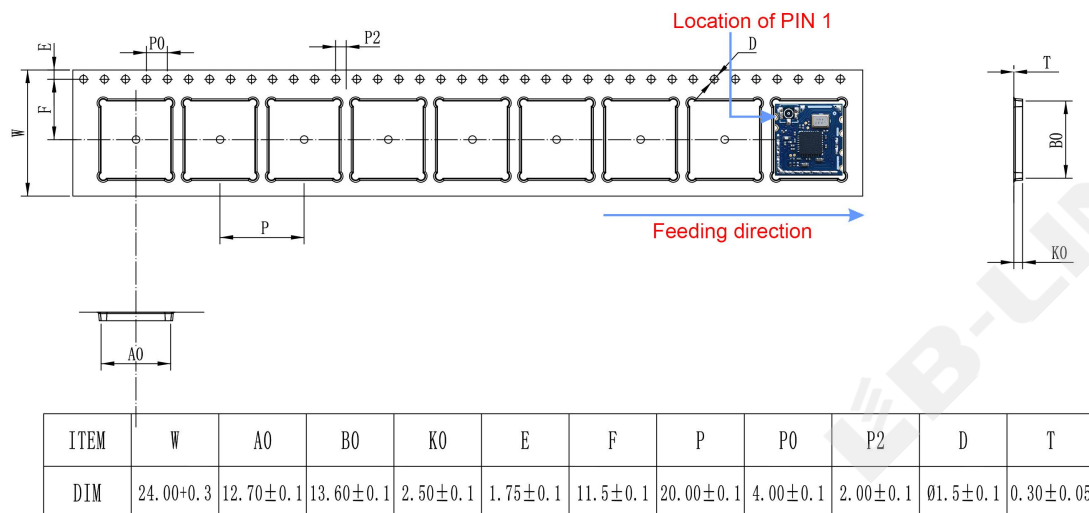
Please use the reflow within 2 times.  
Set up the highest temperature within 250°C.

## 7.Key Components Of Module

| No. | Parts   | Specification | Manufacturer                                                | Note |
|-----|---------|---------------|-------------------------------------------------------------|------|
| 1   | Chipset | SV6355        | Shenzhen iComm Semiconductor CO.,LTD                        |      |
| 2   | PCB     | BL-M6355XU1   | ShenZhen Tie Fa Technology Limited                          |      |
|     |         |               | SHEN ZHEN QILI ELECTRON CO.,LTD                             |      |
|     |         |               | MILLION SOURCE PRINTED CIRCUIT BOARD CO.,LTD                |      |
| 3   | Crystal | 40MHz-3225    | LUCKI CM ELECTRONICS CO.,LTD                                |      |
|     |         |               | JinHua East Crystal Electronic CO.,LTD                      |      |
|     |         |               | HUBEI TKD CRYSTAL ELECTRONIC SCIENCE AND TECHNOLOGY CO.,LTD |      |
|     |         |               | Chengde oscillator Electronic Technology CO.,LTD            |      |

## 8.Package and Storage Information

### 8.1 Package Dimensions



#### Package specification:

- 1,000 modules per roll and 5,000 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 28mm (with a width of 24mm carrying belt).
- Put 1 package of dry agent (20g) and 1 humidity card in each anti-static vacuum bag.
- Each carton is packed with 5 boxes.

## 8.2 Storage Conditions

### Absolute Maximum Ratings:

Storage temperature: -40°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:

ESD Protection: 2KV(HBM, Maximum rating)

The Module is a static-sensitive electronic device.

Do not operate or store near strong electrostatic fields.

Take proper ESD precautions!



**ESD CAUTION**