



# **BL-M8189NS1**

**802.11n 150Mbps WLAN**

**SDIO Module Specification**

**SHENZHEN BILIAN ELECTRONIC CO., LTD**

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(Top view)



(Bottom view)

Module Name: BL-M8189NS1

Module Type: 802.11b/g/n 150Mbps 1T1R WLAN SDIO Module

Revision: V1.2

Customer Approval:

Company:

Title:

Signature:

Date:

Approval:

Title:

Signature:

Date:

## Revision History

Revision	Summary	Release Date	Revised By
0.1	editio princeps	2016-03-09	
1.0	Official release	2016-03-12	
1.1	Update Product labels	2022-07-23	
1.2	Update the specification version	2025-02-17	Cxf

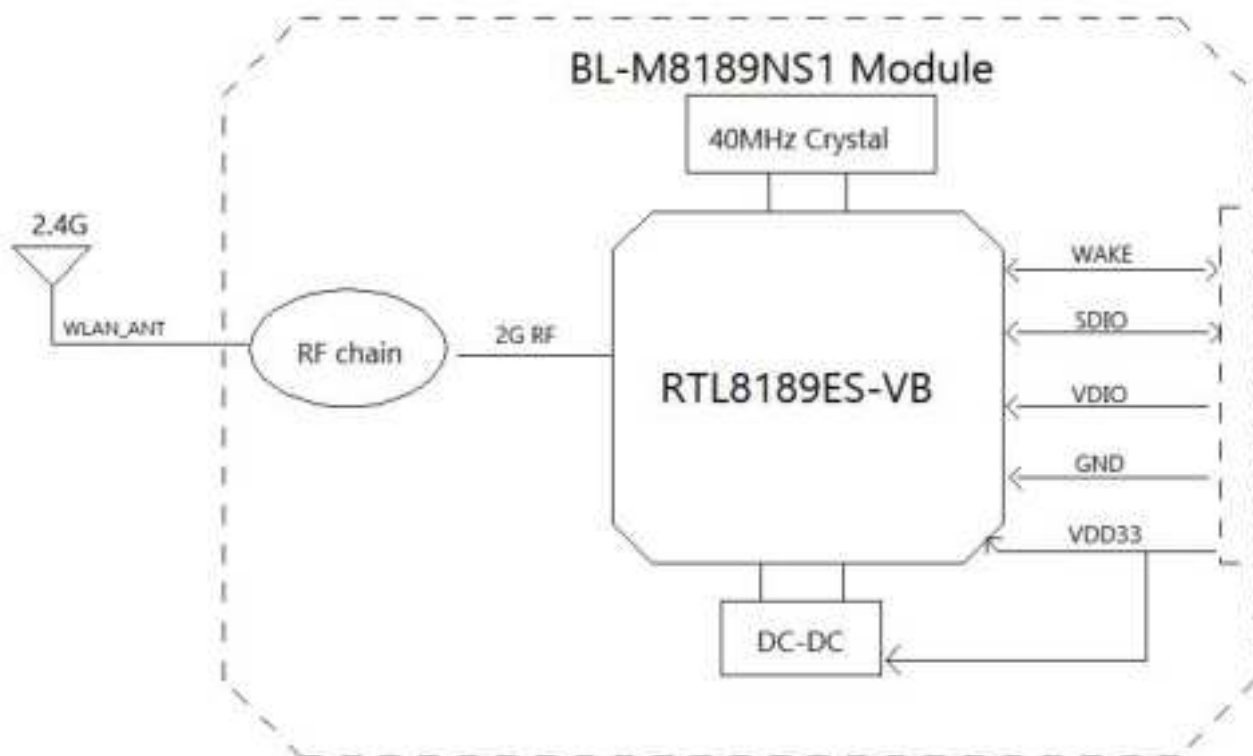
## 1. Introduction

BL-M8189NS1 is a highly integrated WLAN module, it contains a WLAN MAC, a 1T1R capable WLAN base band and radio. It supports IEEE 802.11b/g/n standard and provides the highest PHY rate up to 150Mbps, offering feature-rich wireless connectivity and reliable throughput from an extended distance.

### 1.1 Features

- Operating Frequencies: 2.4~2.4835GHz
- Host Interface is SDIO 2.0
- IEEE Standards: IEEE 802.11b/g/n
- Wireless PHY rate can reach up to 150Mbps
- Connect to external antenna through half hole pad
- Power Supply: DC 3.3V Main Power and DC 3.3V/1.8V I/O Power Supply

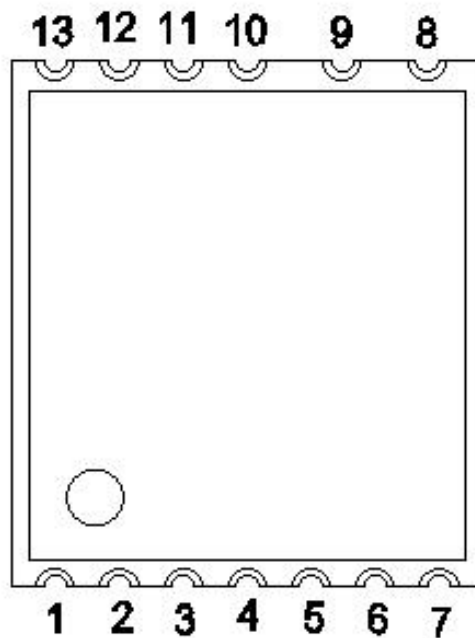
### 1.2 Block Diagram



## 1.3 General Specifications

Module Name	BL-M8189NS1
Chipset	RTL8189ES-VB
WLAN Standards	IEEE802.11b/g/n
Host Interface	SDIO 2.0 for WLAN
Antenna	Connect to the external antenna through half hole pad
Dimension	14*12.5*2.0mm (L*W*H)
Power Supply	DC 3.3V±0.2V @ 500 mA (Max) DC 3.3V±0.2V or 1.8V±0.1V I/O power supply
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	SDIO_CMD	I/O	VDIO	SDIO command/GSPI data input
2	SD_D3	I/O	VDIO	SDIO data 3 /GSPI chip select
3	SD_D2	I/O	VDIO	SDIO data 2
4	SD_D1	I/O	VDIO	SDIO data 1 /GSPI data out
5	SD_D0	I/O	VDIO	SDIO data 0 /GSPI data output
6	SD_CLK	I	VDIO	SDIO clock /GSPI clock
7	GND	P		Ground connections
8	GND	RF		RF Ground connections
9	WLAN_ANT	RF		RF pad for WLAN ANT
10	WAKE	I/O		WLAN to wake-up HOST, pull high for use
11	VDIO	P		VDIO for SDIO pin, the power supply is same as the signal level of SDIO bus. Base on platform to choose 3.3V or 1.8V.
12	VDD33	P		DC3.3V Main power supply
13	CS	I	VDD33	Power down select input, it can externally shut down the module by pulled low (Internal pulled high)

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
External Antenna VSWR			1.7	2.0	/
Supply Voltage	VDD33	3.1	3.3	3.5	V
	VDIO (3.3/1.8)	1.7	1.8	1.9	V
		3.1	3.3	3.5	V

### 3.2 Digital 3.3V GPIO 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
VOH	Output High Voltage	2.97	--	3.5	V
VOL	Output Low Voltage	0	--	0.33	V

### 3.3 Digital 1.8V GPIO DC Specifications

Symbol	Parameter	Min	Typ	Max	Units
VIH	Input High Voltage	1.7	1.8	2.0	V
VIL	Input Low Voltage	--	0	0.8	V
VOH	Output High Voltage	1.62	--	1.8	V
VOL	Output Low Voltage	0	--	0.18	V

### 3.4 Current Consumption

Conditions : VDD33=3.3V ; Ta:25°C			
Use Case	VDD33 Current (average )		
	Typ	Max	Units
WLAN Unassociated (Linux Driver)	172	180	mA
2.4G 11b 1Mbps TX@17dBm (RF-Test)	312	336	mA
2.4G 11b 11Mbps TX@17dBm (RF-Test)	260	270	mA
2.4G 11b 11Mbps RX (RF-Test)	58	59	mA
2.4G 11g 6Mbps TX@16dBm (RF-Test)	302	330	mA
2.4G 11g 54Mbps TX@14dBm (RF-Test)	210	220	mA
2.4G 11g 54Mbps RX (RF-Test)	58	159	mA
2.4G 11n HT20_MCS0 TX@16dBm (RF-Test)	281	296	mA
2.4G 11n HT20_MCS7 TX@14dBm (RF-Test)	165	173	mA
2.4G 11n HT40_MCS0 TX@15dBm (RF-Test)	240	273	mA
2.4G 11n HT40_MCS0 RX (RF-Test)	58	59	mA
2.4G 11n HT40_MCS7 TX@13dBm (RF-Test)	144	157	mA
2.4G 11n HT40_MCS7 RX (RF-Test)	58	59	mA

## 4. WLAN RF Specifications

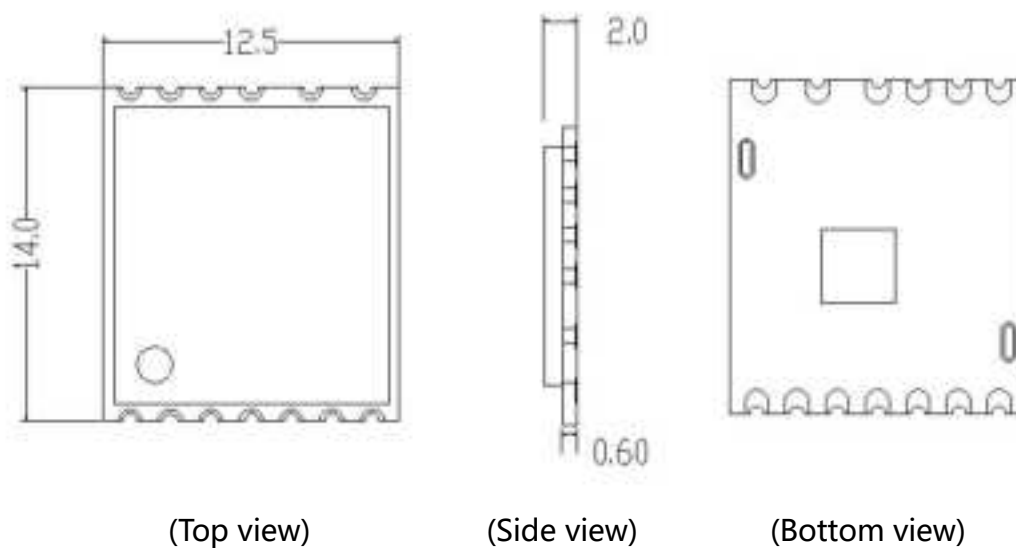
### 4.1 2.4G WLAN RF Specification

Conditions : VDD33=3.3V ; Ta:25°C			
Features	Description		
WLAN Standard	IEEE 802.11b/g/n		
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)		
Channels	Ch1~Ch11(For 20MHz Channels)		
Modulation	802.11b (DSSS): DBPSK, DQPSK, CCK; 802.11g (OFDM): BPSK, QPSK, 16QAM, 64QAM; 802.11n (OFDM): BPSK, QPSK, 16QAM, 64QAM;		
Data Rate	802.11b: 1, 2, 5.5, 11Mbps; 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7 6.5~72.2Mbps; 802.11n (HT40): MCS0~MCS7 13.5~150Mbps;		
Frequency Tolerance	≤ ±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)			
TX Rate	TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11b@1Mbps	Recommended Target TX Power : 17	±1.5	≤ -10dB
802.11b@11Mbps	Calibrated TX Power : 17	±1.5	≤ -10dB
802.11g@6Mbps	Recommended Target TX Power : 16	±1.5	≤ -10dB
802.11g@54Mbps	Calibrated TX Power: 14	±1.5	≤ -25dB
802.11n@HT20_MCS0	Recommended Target TX Power : 16	±1.5	≤ -10dB
802.11n@HT20_MCS7	Calibrated TX Power : 14	±1.5	≤ -28dB
802.11n@HT40_MCS0	Recommended Target TX Power : 15	±1.5	≤ -10dB
802.11n@HT40_MCS7	Calibrated TX Power : 13	±1.5	≤ -28dB
2.4G Receiver Specifications			
RX Rate	Min Input Level(dBm)	Max Input Level(dBm)	PER

802.11b@1Mbps	-92	-10	< 8%
802.11b@11Mbps	-86	-10	< 8%
802.11g@6Mbps	-88	-10	< 10%
802.11g@54Mbps	-72	-10	< 10%
802.11n@HT20_MCS0	-87	-10	< 10%
802.11n@HT20_MCS7	-68	-10	< 10%
802.11n@HT40_MCS0	-85	-10	< 10%
802.11n@HT40_MCS7	-66	-10	< 10%

## 5. Mechanical Specifications

### 5.1 Module Outline Drawing



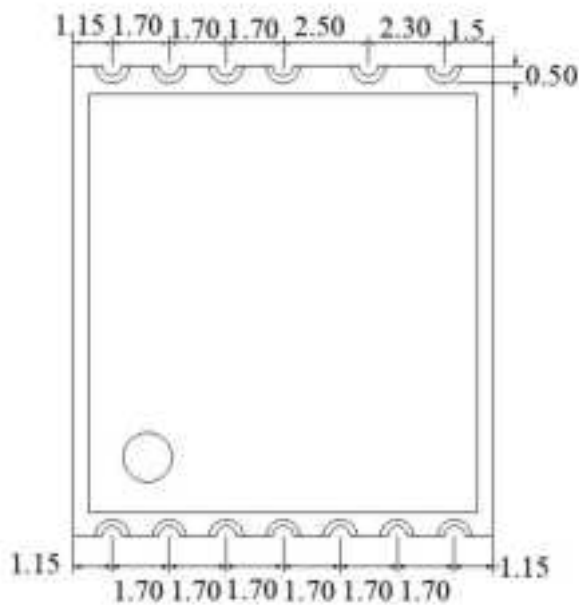
Module dimension: 14.0\*12.5\*2.0mm (L\*W\*H; Tolerance:  $\pm 0.3\text{mm}_L/W$ ,  $\pm 0.2\text{mm}_H$ )



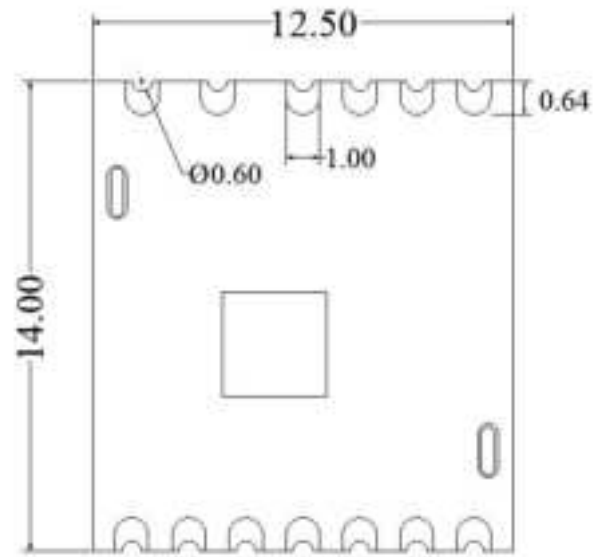
Module Bow and Twist:  $\leq 0.1\text{mm}$



## 5.2 Mechanical Dimensions



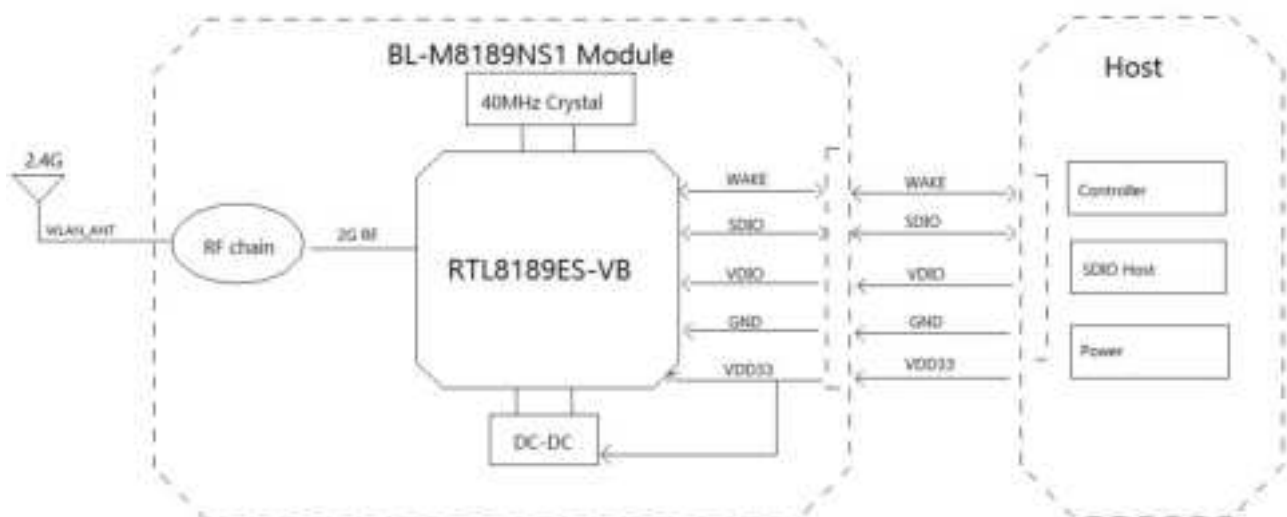
(Top view)



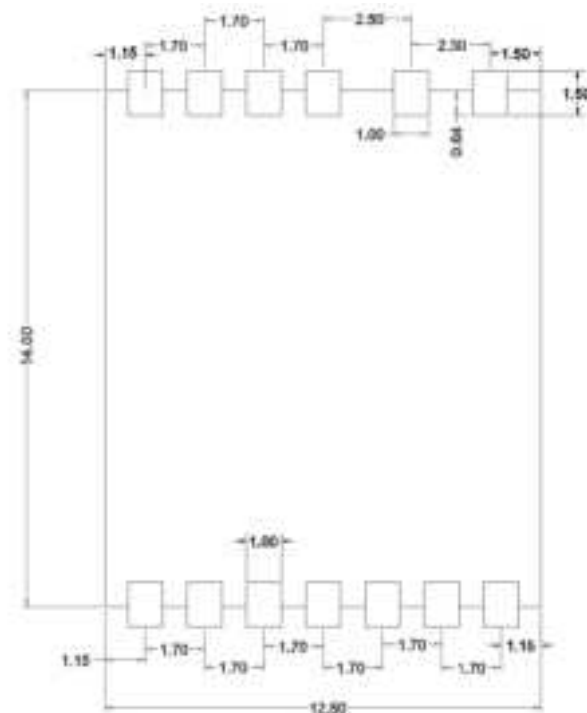
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## 6. Application Information

### 6.1 Typical Application Circuit

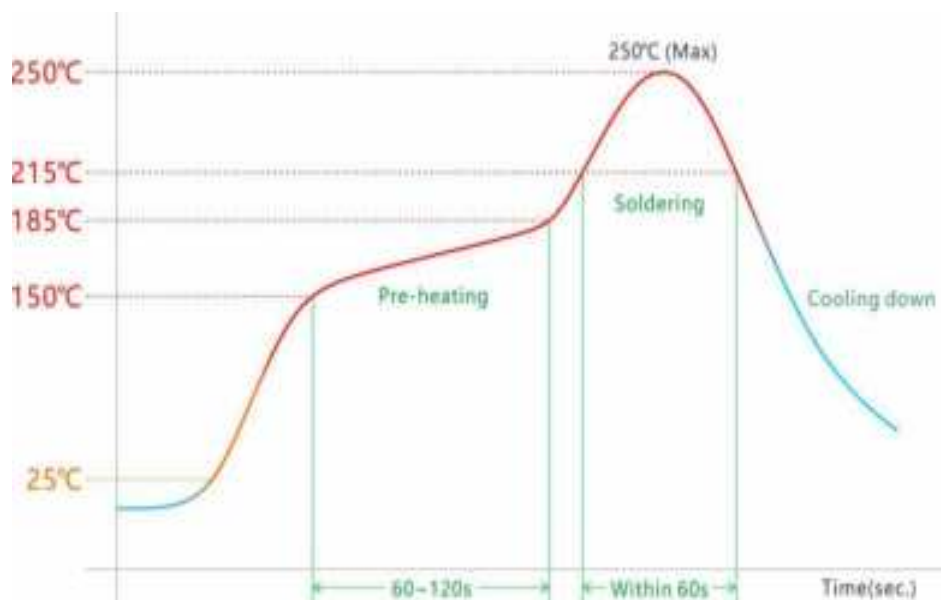


## 6.2 Recommend PCB Layout Footprint



(Design Unit: mm)

## 6.3 Reflow Soldering Standard Conditions



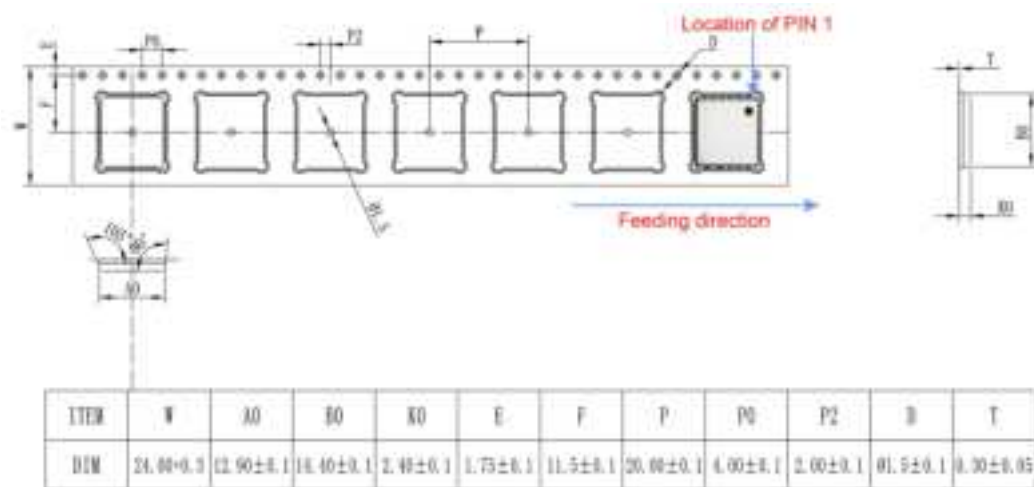
Please use the reflow within 2 times.  
Set up the highest temperature within 250°C.

## 7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8189ES-VB-CG	Realtek Semiconductor Corp.	
2	PCB	BL-M8189NS1	ShenZhen Tie Fa Technology Limited	
			SHEN ZHEN QILI ELECTRON CO.,LTD	
			Quzhou Sunlord Electronics Co.,Ltd	
3	Crystal	40MHz-3225	HOSONIC ELECTRONIC CO.,LTD	
			LUCKI CM ELECTRONICS CO.,LTD	
			JinHua East Crystal Electronic CO.,LTD	

## 8. Package and Storage Information

### 8.1 Package Dimensions





Package 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 21.3mm carrying belt).
4. Put 1 package of dry agent (20g) and humidity card in each anti-static vacuum bag.
5. Each carton is packed with 5 boxes.

## 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: 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 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.

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

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, 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 important announcement

Important Note:

**Radiation Exposure Statement**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

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

Country Code selection feature to be disabled for products marketed to the US/Canada.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,
3. For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change. (if modular only test Channel 1-11)

As long as the three conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**Important Note:**

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

**End Product Labeling**

The final end product must be labeled in a visible area with the following"

Contains **FCC ID: 2AL6KBL-M8189NS1**"

**Manual Information to the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

## Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

### 2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

### 2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

### 2.4 Limited module procedures

Not applicable

### 2.5 Trace antenna designs

Not applicable

### 2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

### 2.7 Antennas

This radio transmitter **FCC ID: 2AL6KBL-M8189NS1** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)		Frequency range:
			Antenna 1	Antenna 2	
2.4G Wi-Fi	/	PIFA Antenna	3.89	N/A	2412-2462MHz

### 2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID:2AL6KBL-M8189NS1**"

### 2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

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

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

### 2.11 Note EMI Considerations

Host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

### 2.12 How to make changes

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.