

# User Manual

***Product Name: EFR32MG21 ZigBee Module***

***Model Name: MSWUP-310A***

## *1. Product introduction*

### **1.1 Summary**

MSWUP-310A ZigBee wireless module, based on silicon labs EM358x series chip, has high performance, low power consumption, works in ISM band, fully supports IEEE802.15.4 standard, supports ZigBee-PRO protocol Stack.

### **1.2 Performance characteristics**

#### **Complete System-on-Chip**

- 32-bit ARM® Cortex -M3 processor
- 2.4 GHz IEEE 802.15.4-2003 transceiver & lower MAC
- 256 or 512 kB flash, with optional read protection
- 32 or 64 kB RAM memory
- AES128 encryption accelerator

#### **Low power consumption, advanced management**

- RX Current (w/ CPU): 27 mA
- TX Current (w/ CPU, +3 dBm TX): 31 mA
- Low deep sleep current, with retained RAM and GPIO: 1.0 uA without/1.25 uA with sleep timer
- Low-frequency internal RC oscillator for low-power sleep timing
- High-frequency internal RC oscillator for fast (110 µs) processor start-up from sleep

#### **Exceptional RF Performance**

- Normal mode link budget up to 103 dB; configurable up to 110 dB
- 100 dBm normal RX sensitivity; configurable to –102 dBm (1% PER, 20 byte packet)

### **1.3 Application scenario**

Internet of Things

Industrial control

Smart Home

Intelligent lighting

Smart Remote control

Health

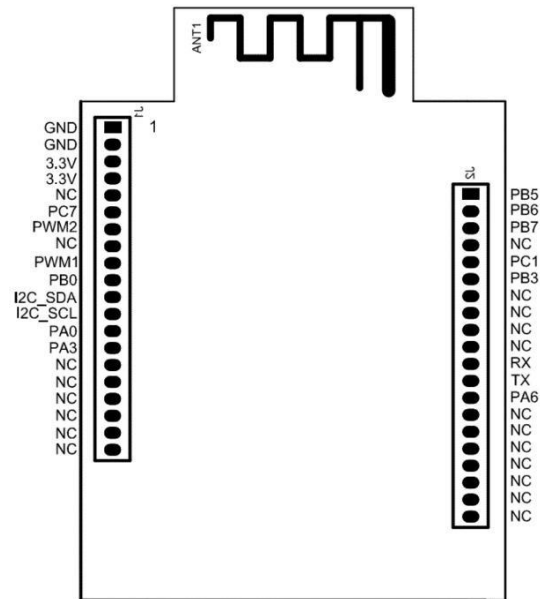
Environmental monitoring

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## 2 Hardware Description

### 2.1 Pin Description

The pins of the MSWUP-310A series module are shown below.

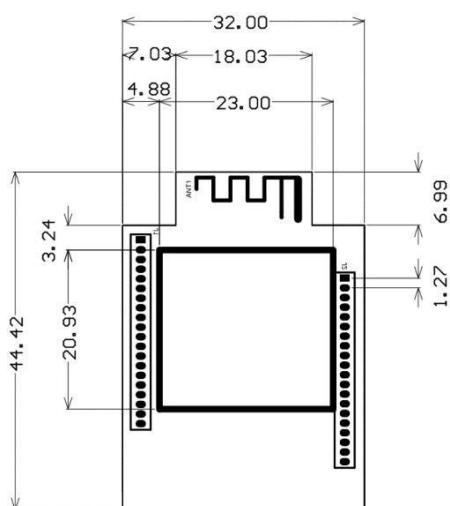


No	Name of Pin	Type	Direction	Description
1	GND	GND	Power	GND
2	GND	GND	Power	GND
3	3.3V	VCC	Power	Supply Voltage 3.3V
4	3.3V	VCC	Power	Supply Voltage 3.3V
5	NC	/	/	/
6	PC7	CMOS	I/O	General IO port
7	PWM2	CMOS	I/O	PWM2

8	NC	/	/	/
9	PWM1			PWM1
10	PB0	CMOS	I/O	General I0 port
11	I2C_SDA	CMOS	I/O	Two Wire serial Interface- data port
12	I2C_SCL	CMOS	I/O	Two Wire serial Interface- clock port
13	PA0	CMOS	I/O	General I0 port
14	PA3	CMOS	I/O	General I0 port
15	NC	/	/	/
16	NC	/	/	/
17	NC	/	/	/
18	NC	/	/	/
19	NC	/	/	/
20	NC	/	/	/
21	PB5	CMOS	I/O	General I0 port
22	PB6	CMOS	I/O	General I0 port
23	PB7	CMOS	I/O	General I0 port
24	NC	/	/	/
25	PC1	CMOS	I/O	General I0 port
26	PB3	CMOS	I/O	General I0 port
27	NC	/	/	/
28	NC	/	/	/
29	NC	/	/	/
30	NC	/	/	/
31	RX	CMOS	I/O	UART RX
32	TX	CMOS	I/O	UART tx
33	PA6	CMOS	I/O	General I0 port
34	NC	/	/	/
35	NC	/	/	/
36	NC	/	/	/
37	NC	/	/	/
38	NC	/	/	/
39	NC	/	/	/
40	NC	/	/	/

## 2.2 Package size

The following figure shows the dimensions of the MSWUP-310A module. Including shield height  
3.4  
±0.2mm.



### 3. Specifications

#### 3.1 Electrical characteristics limit parameters

Modules must be within the conditions described below and may cause damage beyond the range described in the table below.

Parameter	Min.	Max.
Supply voltage	-0.3V	3.6V
All pins	-0.3V	VDD+0.3V
Stored temperature	-40° C	150° C

#### 3.2 Working conditions

Parameter	Min.	Max.
Working voltage	2.0V	3.6V
Environmental temperature	-40° C	85° C

#### 3.3 Working current

Test conditions VDD=3.0V @ +25° C

Operating mode	Min.	Max.
Sleep mode	1uA	1.25uA
RF reception	27mA	28mA
RF transmission	31mA	60mA

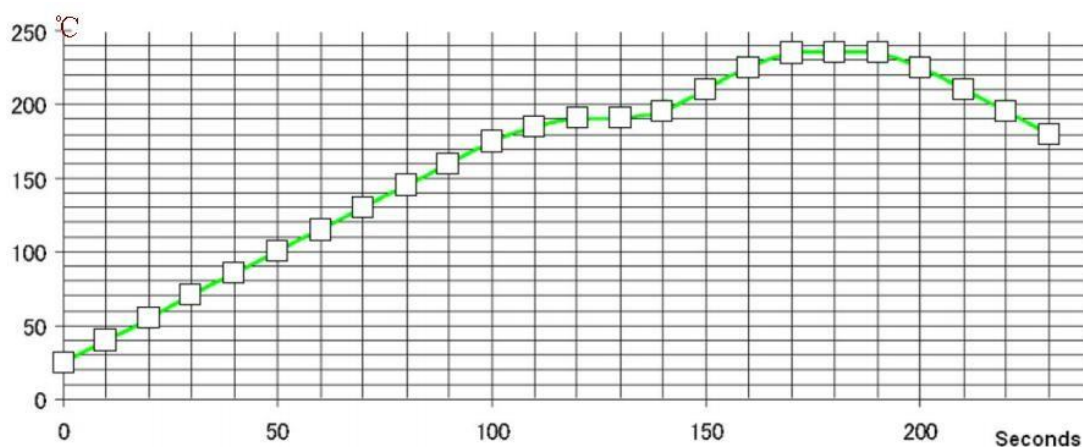
#### 3.4 RF characteristics

Receiving sensitivity	-102dBm	
Transmit power	16.5dBm	

Center frequency offset	±40ppm	including temperature range and aging
RF output impedance	50 Ω	

#### 4 Welding

Reflow soldering is recommended to operate according to the temperature curve shown below.



Temperature	25~160°C	160 ~ 190°C	>220°C	220°C~Pk.	Pk. Temp (235°C)
Target time(s)	90~130	30~60	20-50	10-15	150-270

#### 5. Certification

FCC

# OEM Guidance

## 1. Applicable FCC rules

This module is granted by Single Modular Approval. It complies to the requirements of FCC part 15C, section 15.247 rules.

## 2. The specific operational use conditions

This module can be used in IoT devices. The input voltage to the module is nominally 3.3V DC. The operational ambient temperature of the module is -40 to 85 degree C. Only the embedded PCB antenna is allowed. Any other external antenna is prohibited.

## 3. Limited module procedures

Not Limited module

## 4. Trace antenna design

Not using Trace antenna design

## 5. RF exposure considerations

The 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. If the equipment built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by 2.1093.

**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,

As long as the two 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: **2AV5NMSWUP-310A** "

**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:2AV5NMSWUP-310A** 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:
Zigbee	/	PCB Antenna	0.0dBi	2400-2500MHz

### 2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID:2AV5NMSWUP-310A**".

### 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.

## ISED Statement

- English: This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

The digital apparatus complies with Canadian CAN ICES-3 (B)/NMB-3(B).

- French: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement. L'appareil numérique du CIEM conforme canadien peut - 3 (b) / nmb - 3 (b).

This device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS 102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

cet appareil est conforme à l'exemption des limites d'évaluation courante dans la section 2.5 du CNR - 102 et conformité avec RSS 102 de l'exposition aux RF, les utilisateurs peuvent obtenir des données canadiennes sur l'exposition aux champs RF et la conformité.

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

Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé.

This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Cet équipement doit être installé et utilisé à une distance minimale de 20 cm entre le radiateur et votre corps.

### ISED Modular Usage Statement

NOTE 1: When the ISED certification 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 the wording "Contains transmitter module IC: 30046-MSWUP310A" or "Contains IC: 30046-MSWUP310A".

**NOTE 1:** Lorsque le numéro de certification ISED n'est pas visible lorsque le module est installé dans un autre appareil, l'extérieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module inclus. Cette étiquette extérieure peut être libellée Contient le module émetteur IC: 30046-MSWUP310A ou Contient IC: 30046-MSWUP310A.