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MXCHIP® 智能硬件解决方案提供商

EMW3080(A)/EMW3080(B)

Datasheet

Embedded encryption security Wi-Fi module

Vision：1.3   Date：2017-05-11   Number: DS0069EN

Abstract

Features

- Support 802.11b/g/n, integrate ARM-CM4F, WLAN MAC/Baseband/RF

- 256KB RAM/ 2MB FLASH

- Working Voltage: DC 3.0-3.6V

- Maximum transmission rate up to 72.2 Mbps with 20 MHz bandwidth.

- Maximum transmission rate up to 150 Mbps with 40 MHz bandwidth.

- EMW3080B is the standard version；EMW3080A has hardware encryption to improve the security level of Cloud connection and firmware protection. Security level in accordance with CC EAL5+ AVA_VAN5

- EMW3080(A) Hardware Encryption Features

  - Encrypt firmware of clients to prevent cracking

  - Digital signature is used in firmware to ensure integrity and legality, preventing being tampering or replaced in OTA.

  - Automatically generate private key to save the certificate issued from the cloud, the cloud can identify the legality of the device to prevent illegal, counterfeit, non-secure accessing.

  - Prevent hackers to obtain sensitive data and code

- Wi-Fi Features

  - Support 802.11b/g/n，HT-40

- Support Station, Soft AP, Station+Soft AP

- Support EasyLink，Alink，Joinlink

- Antenna: PCB or IPX (Optional)

- Peripherals：

  - 2x UART

  - 2x I2C

  - 1x SPI

  - 1x SWD

  - 6x PWM

  - Up to 13GPIOs

- Operating Temperature：-20℃ to +85℃

Application

- Intelligent lighting

- Intelligent Transportation

- Smart Home Application

- industrial automation

- Intelligent Security

Module Type

Type	Illustration
EMW3080(AP)	Hardware Encryption, PCB
EMW3080(AE)	Hardware Encryption, IPEX
EMW3080(BP)	No Hardware Encryption, PCB
EMW3080(BE)	No Hardware Encryption, IPEX

Hardware Block

EMW3080(A) Wi-Fi Module Block Diagram

SOC
133MHz Cortex-M4F MCU

UART x 2
I²C x 2
PWM x 5
VBAT_MEAS
SWD
GPIO x 11

40MHz OSC
Encryption Chip

256KB SRAM
802.11b/g/n MAC
512KB ROM
2.4GHz Radio
Power Management

On-board PCB Ant
U.F.L connector

2MB Flash SPI

3.3V Input

EMW3080(A)

EMW3080(B) Wi-Fi Module Block Diagram

SOC
133MHz Cortex-M4F MCU

UART x 2
I²C x 2
SPI x 1
PWM x 6
VBAT_MEAS
SWD
GPIO x 13

40MHz OSC

256KB SRAM
802.11b/g/n MAC
512KB ROM
2.4GHz Radio
Power Management

On-board PCB Ant
U.F.L connector

2MB Flash SPI

3.3V Input

EWM3080(B)

Copyright Notice

Version Illustration

Date	Vision	Details
2017-01-16	1.0	Initial document
2017-02-13	1.1	Update label, package, RF reference, encryption. Add BOOT/EASYLINK description
2017-03-06	1.2	Update LGA PCB package Update pin definition Update power consumption data
2017-3-27	1.21	Update PIN information
2017-3-31	1.22	Update Antenna Zone Diagram
2017-5-11	1.3	Update storage temperature

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1. Product Introduction

EMW3080 is a cost-effective embedded Wi-Fi module released by MXCHIP with high integrating ARM CM4F, WLAN MAC/Baseband/RF. Maximum frequency 133MHz with 256KB SRAM and 2M FLASH. Power supply is DC 3.3V. Mounting mode is LGA SMT or DIP(Dual In-line Package). Peripherals: 2xUART / 1x SPI /2x I2C / 6x PWM / Up to 13 GPIOs.

EMW3080 runs MiCO 3.0 IoT operating system, supporting Micoder IDE. Provide fast, stable and secure end-to-end cloud links to users with integrate TCP/IP protocol stack, various security encryption algorithm, intelligent cloud such as MXCHIP easylink/Alink 1.1/Joinlink 3.0/Hilink/One Net/Gome/Suning, oversea cloud such as AWS/Ayla/Azure/IBM Watson/Google/Apple Homekit.

EMW3080 (A): Provide security encryption chip to the integrity and legality and cloud communication safety of client firmware.

EMW3080 (B): Abundant peripherals and memory to supply most application and multi-cloud requirement.

Hardware diagram is shown below with four main parts:

- CM4F main core

- WLAN MAC/BB/RF/ANT

- Hardware encryption

- Power management

With:

1. ARM CM4F CPU with 133MHz maximum frequency and 256KB SRAM and 2M FLASH. Support high speed UART, I2C, SPI, PWM and multi-GPIO.

2. 2MB SPI Flash is used for custom firmware development

3. Support PCB antenna and IPEX

4. Input voltage: DC 3.3V
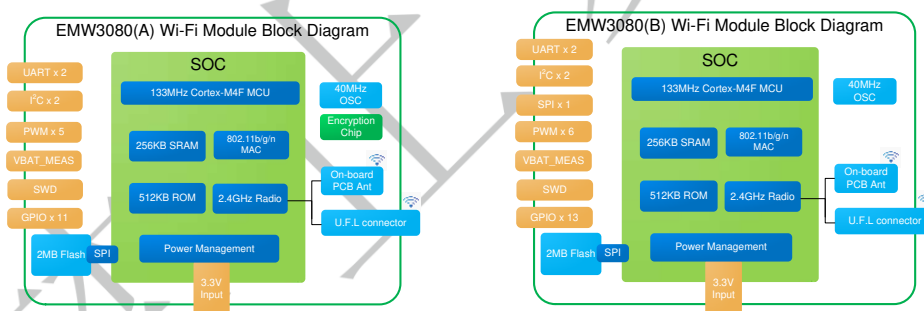
EMW3080 Hardware block

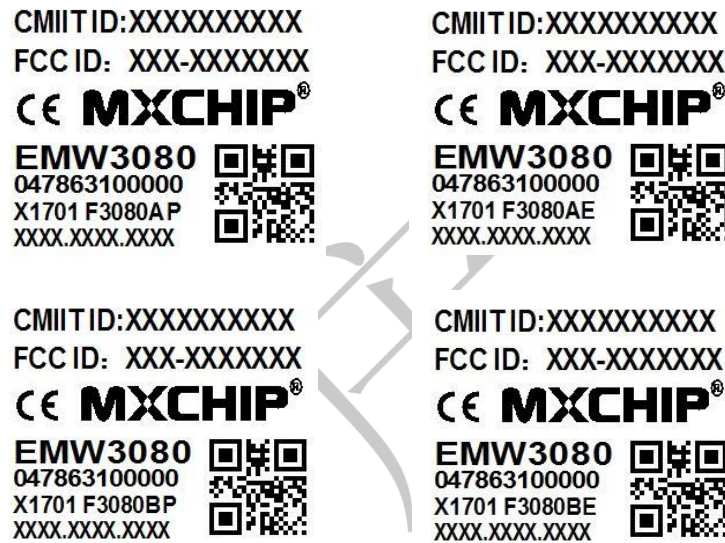|	EMW3080(A)	EMW3080(B)
Encryption security chip	Inside	External support
CPU	ARM CM4F	
CPU Maximum Speed	133MHz	133MHz
SRAM	256KB	256KB
Flash（QSPI 100MHz）	2MB （Support XIP CACHE running and decrypting）	
UART (Up to 6Mbps)	2	2
I2C (400KHz)	2	2
SPI (31.25MHz)	None	1
PWM (Maximum 4MHz)	5	6
SWD debug port	1	1
Debug port	1	1
GPIO(Output current 4mA)	11	13

1.1 EMW3080 Label Information

Figure 1 EMW3080 Label Information

Label Information：

CMIIT ID:XXXXXXXX : SRRC approval number

FCC ID:XXX-XXXXXXX :FCC certification information

CE: CE authentication log

EMW3080: Module type

047863100000：MAC address (Each module has a unique MAC address)

F3080AP /F3080AE: Sub model type of module A, PCB antenna or IPEX

F3080BP /F3080BE: Sub model type of module B, PCB antenna or IPEX

X1701：production batch

XXXX.XXXX.XXXX : SN series number

1.2 Pin Arrangement

EMW3080 has LGA package and DIP package, DIP package (as shown in figure 2) could effectively reduce the quality risk of second patch；LGA package (as shown in figure 3) is easy to debug, provide multi-choice for customers.

Solder mask openness has the same size with land. The width of steel mesh is suggested to be 0.12mm to 0.14mm in SMT.

Figure 2　DIP Package Size
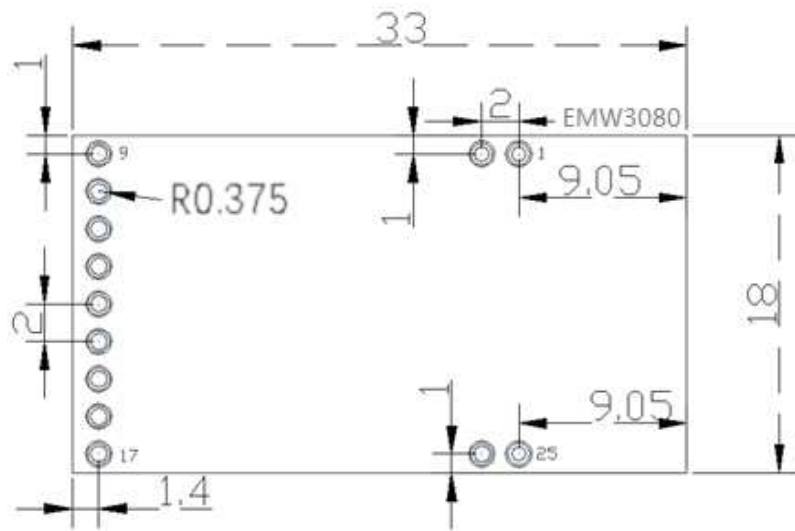
Figure 2　DIP Package Size
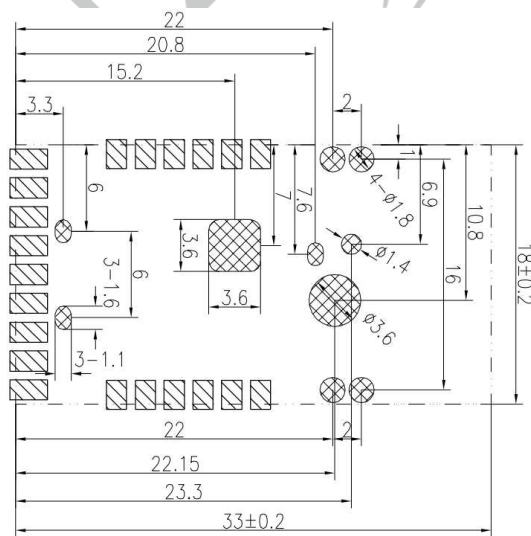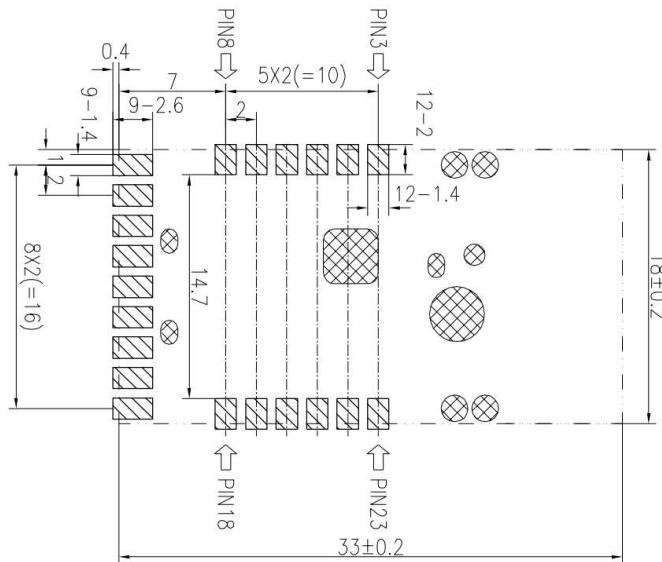
Note:

1.   Shadow like this ⬜ means the soldering pad on customer's PCB.

2.   Shadow like this ▦ means where there should NOT be soldering pad on customer's PCB.

Figure 3   LGA Package Size

1.3 Pin Definition

1.3.1   EMW3080 Package Definition
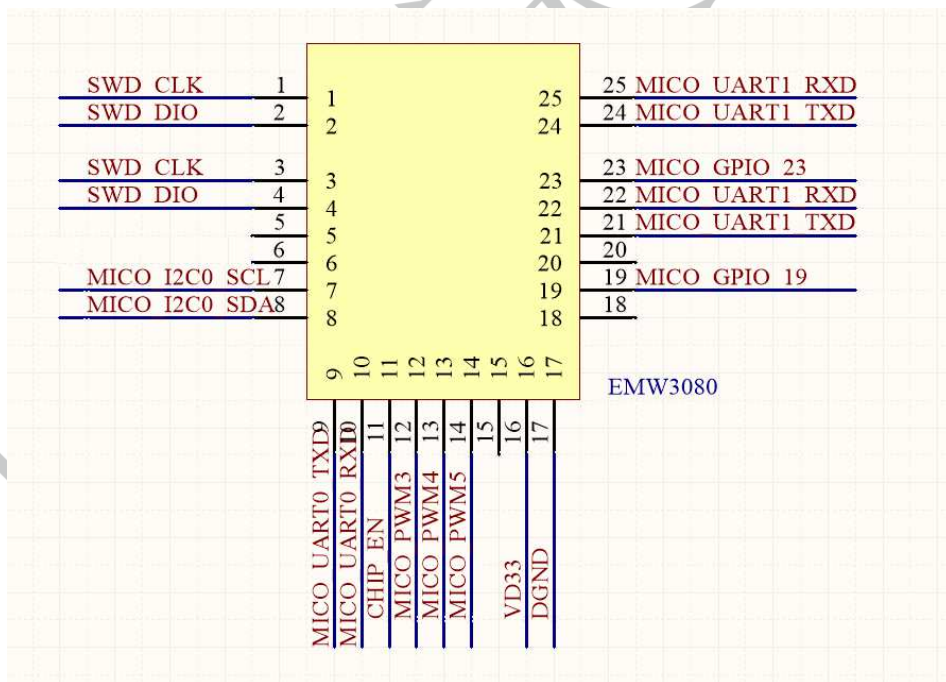
Figure 4 EMW3080 Package Definition

1.3.2   EMW3080 Pin Definition

Table 1 EMW3080 Pin Definition

引脚号	FUNCTION1	FUNCTION2	FUNCTION3	FUNCTION4	FUNCTION5	FUNCTION6
1, 3	MICO_GPIO_1			MICO_PWM1		SWCLK
2, 4	MICO_GPIO_2			MICO_PWM2		SWDIO
5	NC					
6	NC					
7	MICO_GPIO_7	MICO_I2C0_SCL	MICO_UART0_RTS	MICO_PWM6	MICO_SPI1_MISO	

8	MICO_GPIO_8	MICO_I2C0_SDA	MICO_UART0_CTS		MICO_SPI1_CS	
9	MICO_GPIO_9	MICO_I2C1_SDA	MICO_UART0_TXD	MICO_PWM1	MICO_SPI1_MOSI	
10	MICO_GPIO_10	MICO_I2C1_CLK	MICO_UART0_RXD		MICO_SPI1_CLK	
11	CHIP_EN					
12	MICO_GPIO_12			MICO_PWM3		
13	MICO_GPIO_13			MICO_PWM4		
14	MICO_GPIO_14			MICO_PWM5		
15	NC					
16	VDD					
17	GND					
18	NC					
19	MICO_GPIO_19					
20	NC					
21, 24	MICO_GPIO_21	MICO_I2C0_SDA	MICO_UART1_TXD	MICO_PWM4		
22, 25	MICO_GPIO_22	MICO_I2C0_SCL	MICO_UART1_RXD	MICO_PWM5		
23	MICO_GPIO_23					

Notes：

(1) **words in black color** is the common pins in both A and B, words in blue color is unique pins of B module. Compare to A module, EMW3080(B) has four pins: PIN 7, 8, 9, 10 with function: traffic control of UART, SPI function, PWM output and GPIO.

(2) PIN 19 is used as BOOT，PIN23 is used as EASYLINK, please do not use pin 19 and 23 in hardware design. Please contact engineer of MXCHIP if it is necessary to use the two pins.

(3) PIN21/24should be in high voltage or NC when power on, please aware it when designing circuit.

(4) CHIP_EN could not be set NC, the other pins should not be set NC.

2. Electrical Parameters

2.1 Operating Conditions

EMW3080 would be unstable when input voltage is less than the lowest rated voltage.

Table 2 Range of input voltage

Symbol	Illustration	Condition	Details			
			Minimum	Typ	Maximum	Unit
VDD	Power Supply		3.0	3.3	3.6	V

There would be permanent damage in hardware if the device operates at the voltage over rated value. Meanwhile, reliability could be influenced when the device has a long-term operating at maximum voltage.

Table 3 Absolute maximum voltage rating

Symbol	Description	Minimum	Typ	Unit
VDD	Module input voltage	−0.3	3.6	V
VIN	GPIO input voltage	−0.3	3.6	V

2.2 Power Consumption

Table 4 EMW3080 Power Consumption

Status	Average current（3V3）	Max current（3V3）	Description
WIFI Initialization	26.91mA	33.1mA	WIFI low power mode enabled
WIFI Connected	47.71mA	119.5mA	Keep connected with the router WIFI low power mode enabled
UDP transmission	168.37mA	298.7mA	WIFI low power mode disabled
SoftAP	121.48mA	260.4mA	SoftAP connect to internet
Easylink	122.84mA	136.7mA	Process of module network distribution
Standby	10.45uA	12.07uA	Ultra low standby power mode

Actual working current is variable at different operating mode. Maximum operating current 300 mA 。

2.3 Working Environment

Table 5 Temperature and humidity condition

Symbol	Name	Maximum	Unit
TSTG	Storage Temperature	-20 to +85	℃
TA	Operation Temperature	-20 to +85	℃
Humidity	Non-condensing, Relative humidity	95	%

2.4 Electrostatic Discharge

Table 6 Electrostatic Discharge Parameters

Symbol	Name	Details	Level	Maximum	Unit
V_{ESD}(HBM)	Electrostatic discharge voltage (Human Body Model)	TA= +25 °C , JESD22-A114	2	2000	V
V_{ESD}(CDM)	Electrostatic discharge voltage (Charged Device Model)	TA = +25 °C , JESD22-C101	II	500	

3. RF parameters

3.1 Basic RF parameters

Table 7 Radio-frequency standards

Name		Illustration
Working frequency		2.412~2.484GHz
Wi-Fi wireless standard		IEEE802.11b/g/n
Data transmission rate	20MHz	11b：1,2,5.5 和 11Mbps 11g : 6,9,12,18,24,36,48,54Mbps 11n : MCS0~7,72.2Mbps
	40MHz	11n：MCS0~7,150Mbps
Antenna type		PCB (Default) IPX (Optional)

3.2 TX Performance

3.2.1 Transmit performance of IEEE802.11b mode

Table 8 CCK_11 transmit performance parameters of IEEE802.11b mode

Channel	Output Power （dBm）	EVM(dB)	Frequency off-set (ppm)
1	17.3 dBm	-21dB	-3.2ppm
2	17.3 dBm	-21.5dB	-3.2ppm
3	17.4 dBm	-21.3dB	-3.2ppm
4	17.4 dBm	-21dB	-3.2ppm
5	17.4 dBm	-21dB	-3.2ppm
6	18 dBm	-21.3dB	-3.2ppm
7	18 dBm	-20.7dB	-3.2ppm
8	17.9 dBm	-20.7dB	-3.2ppm
9	17.8 dBm	-20.8dB	-3.2ppm
10	17.7 dBm	-21.3dB	-3.2ppm
11	17.6 dBm	-21dB	-3.2ppm
12	17.5 dBm	-21.2dB	-3.2ppm
13	17.4 dBm	-21.1dB	-3.2ppm

3.2.2 Transmit performance of IEEE802.11g mode

Table 9 OFDM_54 transmit performance parameters of IEEE802.11g mode

Channel	Output Power（dBm）	EVM(dB)	Frequency off-set (ppm)
1	14.6dBm	-30.4dB	-3ppm
2	14.7dBm	-29.3dB	-3ppm
3	14.7dBm	-29.8dB	-3ppm
4	14.9dBm	-29.9dB	-3ppm
5	14.9dBm	-28.6dB	-3ppm
6	15dBm	-29.4dB	-3ppm
7	14.9dBm	-29.1dB	-3ppm
8	15dBm	-29dB	-3ppm
9	14.8dBm	-29dB	-3ppm
10	14.7dBm	-29.8dB	-3ppm
11	14.6dBm	-29dB	-3ppm
12	14.4dBm	-28.9dB	-3ppm
13	14.3dBm	-28.6dB	-3ppm

3.2.3 Transmit performance of IEEE802.11n-HT20 mode

Table 10 MCS7 transmit performance parameters of IEEE802.11n-HT20 mode

Channel	Output Power（dBm）	EVM(dB)	Frequency off-set (ppm)
1	13.4dBm	-32dB	-3.5ppm
2	13.7dBm	-30.5dB	-3.5ppm
3	13.7dBm	-31.1dB	-3.5ppm
4	13.8dBm	-31.9dB	-3.5ppm
5	13.8dBm	-30.8dB	-3.5ppm
6	13.9dBm	-29.4dB	-3.5ppm
7	13.9dBm	-31.3dB	-3.5ppm
8	13.9dBm	-30dB	-3.5ppm
9	13.7dBm	-31.3dB	-3.5ppm
10	13.7dBm	-31.7dB	-3.5ppm
11	13.5dBm	-30.7dB	-3.5ppm
12	13.5dBm	-31dB	-3.5ppm
13	13.2dBm	-30dB	-3.5ppm

Table 11 MCS7 Transmit Performance of IEEE802.11n-HT 40MHz mode

Channel	Output Power（dBm）	EVM(dB)	Frequency off-set (ppm)
3	13.9dBm	-32.7dB	-3.6ppm
4	14.1dBm	-31.9dB	-3.6ppm
5	14.1dBm	-32.1dB	-3.6ppm
6	14.3dBm	-32.5dB	-3.6ppm
7	14.2dBm	-32.3dB	-3.6ppm
8	14.2dBm	-32.1dB	-3.6ppm
9	14dBm	-32.6dB	-3.6ppm
10	14.1dBm	-32.2dB	-3.6ppm
11	13.8dBm	-32.1dB	-3.6ppm

3.3 RX Receive Sensitivity

3.3.1 IEEE802.11b Mode

Table 12 Receive Sensitivity of IEEE802.11b Mode with Bandwidth 20MHz(dBm)

Rate \ Channel	11M	1M
IEEE spec	-76dBm	-83dBm
1	-90dBm	-100dBm
2	-90dBm	-100dBm
3	-90dBm	-100dBm
4	-90dBm	-100dBm
5	-90dBm	-100dBm
6	-90dBm	-100dBm
7	-90dBm	-100dBm
8	-90dBm	-100dBm
9	-90dBm	-100dBm
10	-90dBm	-100dBm
11	-90dBm	-100dBm
12	-90dBm	-100dBm
13	-90dBm	-100dBm

3.3.2 IEEE802.11g Mode

Table 13 Receive Sensitivity of IEEE802.11g Mode with Bandwidth 20MHz(dBm)

Rate / Channel	54M	6M
IEEE spec	-65dBm	-82dBm
1	-76dBm	-92dBm
2	-76dBm	-92dBm
3	-76dBm	-92dBm
4	-76dBm	-92dBm
5	-76dBm	-92dBm
6	-76dBm	-92dBm
7	-76dBm	-92dBm
8	-76dBm	-92dBm
9	-76dBm	-92dBm
10	-76dBm	-92dBm
11	-76dBm	-92dBm
12	-76dBm	-92dBm
13	-76dBm	-92dBm

3.3.3 IEEE802.11n-HT Mode

Table 14 Receive Sensitivity of IEEE802.11n-HT20 Mode with Bandwidth 20MHz(dBm)

Channel / Rate	MCS7	MCS0
IEEE spec	-64dBm	-82dBm
1	-73dBm	-92dBm
2	-73dBm	-92dBm
3	-73dBm	-92dBm
4	-73dBm	-92dBm
5	-73dBm	-92dBm
6	-73dBm	-92dBm
7	-73dBm	-92dBm
8	-73dBm	-92dBm
9	-73dBm	-92dBm
10	-73dBm	-92dBm

Channel Rate	MCS7	MCS0
11	-73dBm	-92dBm
12	-73dBm	-92dBm
13	-73dBm	-92dBm

Table 15 Receive Sensitivity of IEEE802.11n-HT40 Mode (dBm)

Rate Channel	MCS7	MCS0
IEEE spec	-64dBm	-82dBm
3	-69dBm	-89dBm
4	-69dBm	-89dBm
5	-69dBm	-89dBm
6	-69dBm	-89dBm
7	-69dBm	-89dBm
8	-69dBm	-89dBm
9	-69dBm	-89dBm
10	-69dBm	-89dBm
11	-69dBm	-89dBm

4. Antenna Information

4.1 Antenna Type

EMW3080 has two type of antenna: EMW3080(AP/BP) and EMW3080(AE/BE)

EWM3080（AP）

EMW3080(BP)

EMW3080(AE)

EMW3080(BE)

4.2 PCB Antenna Clearance Zone

Main PCB should have a distance over 16mm with other metal elements when using PCB antenna in Wi-Fi device. Shadow parts in the figure below should keep away from metal elements, sensor, interference source and other material that could cause signal interference.
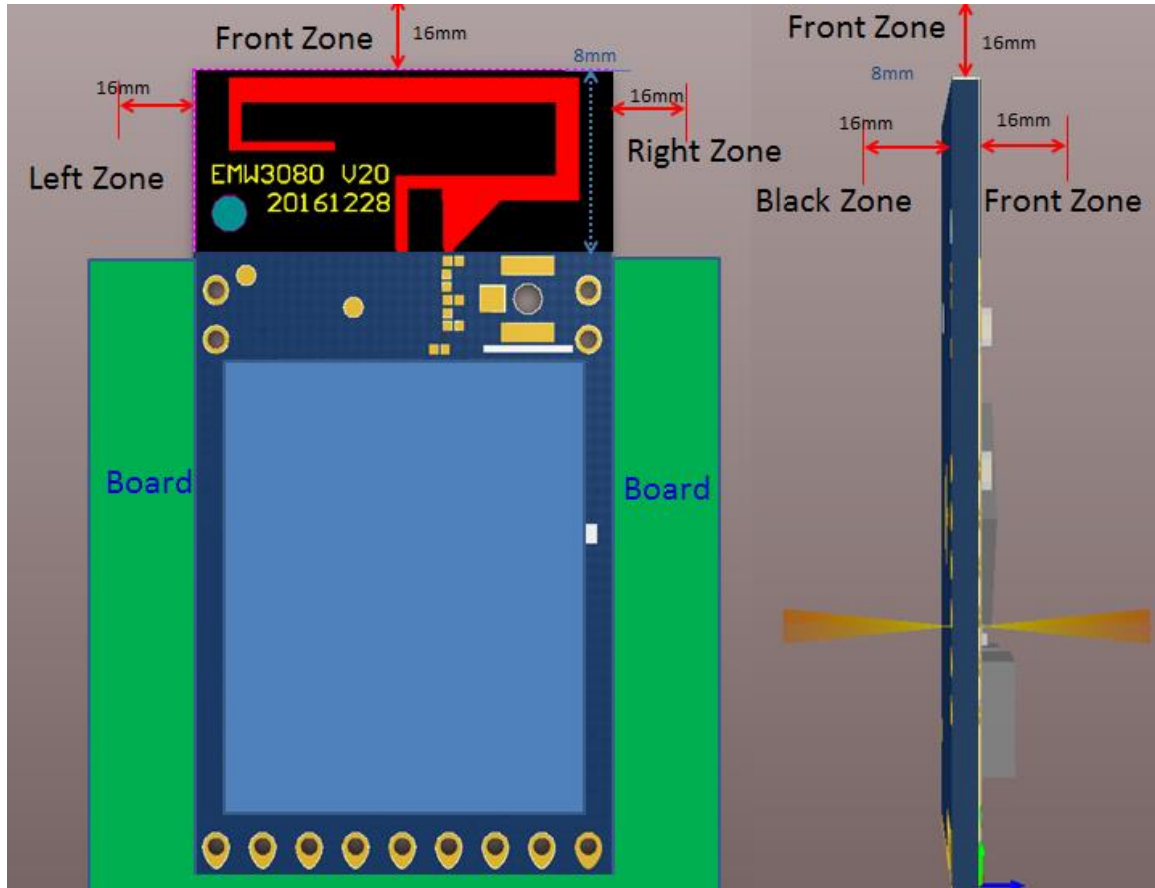
Figure 5 Minimum Clearance Zone of PCB Antenna (Unit: mm)

4.3 External Antenna Connector
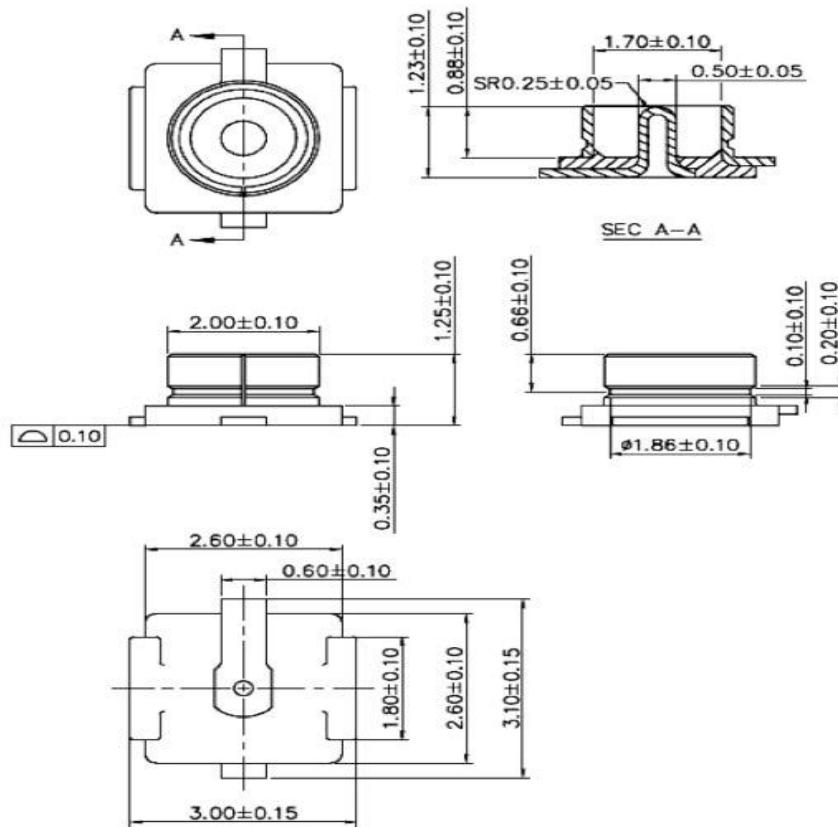
Figure 6 Size of External Antenna Connector

5. Assembly Information and Production Guidance

5.1 Assembly Size

Top View
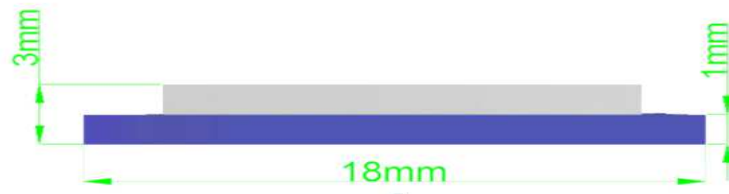
Left Side View
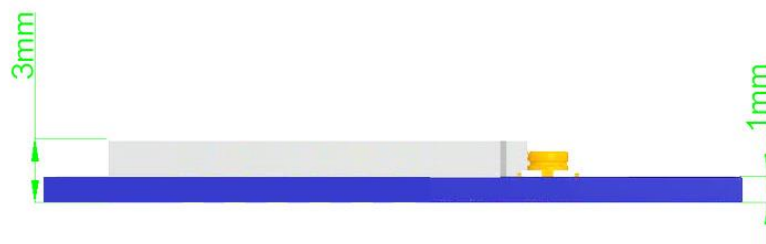
Side View

Figure 7 EMW3080Side View (Unit: mm)

5.2 Production Guidance（Important）

● The stamp hole package module produced by Mxchip must completely being patched by SMT machine in 24 hours after open firmware package. Otherwise the module should be re-package by vacuum pumping and drying before patch.

- Devices for SMT patch:

    （1）Reflow soldering machine

    （2）AOI detector

    （3）Suction nozzle with 6-8mm caliber

- Device for drying:

    （1）Cabinet type oven

    （2）Anti-static and high thermos tolerant tray

    （3）Anti-static and high thermos tolerant gloves

● Conditions of product storage (Storage environment is shown in figure 8):

- Moisture bag must be stored in temperature below 30 and humidity less than 85%RH.

- Dry packaging products, the guarantee period should be from 6 months date of packing seal.

- Humidity indicator card is in the hermetic package.

Figure 8 Humidity Card

● Humidity indicator card and drying situation:

- 2 hours drying for module if the color ring at 30%, 40%, 50% in humidity indicator card is blue after unpacking;

- 4 hours drying for module if the color ring at 30% in humidity indicator card is pink after unpacking;

- 6 hours drying for module if the color ring at 30%, 40% in humidity indicator card is pink after

unpacking;

▪ 12 hours drying for module if the color ring at 30%, 40%, 50% in humidity indicator card is pink after unpacking.

● Drying parameters:

▪ Drying temperature: 125℃±5℃；

▪ Alarm temperature: 130℃；

▪ SMT patch when the device cool down below 36℃ in natural condition;

▪ Dry times: 1；

▪ Please dry again if the module is unsoldering in 12 hours after last drying.

● SMT is unsuitable if the module packed over 3 months. There would be serious oxidation of the pad because of immersion gold and cause false welding and lack of weld. Mxchip does not assume the corresponding responsibility;

● ESD protection is required before SMT;

● SMT patch should on the basis of reflow profile diagram, maximum temperature 245℃， reflow profile diagram is shown in figure 10;

● In order to guarantee the reflow soldering qualification rate, vision and AOI detection should be done in 10% products for the first patch to make sure the rationality of temperature control, device adsorption mode and position. Detect 5 to 10 sample every hour in the following batch production.

5.3 Considerations

● Operator should wear anti-static gloves during producing;

● No more than drying time;

● Any explosive, flammable and corrosive material is not allowed to add in drying;

● Module should be put into oven with high thermotolerant tray. Ventilation should exist between each module and no direct contact with oven;

● Make sure oven is closed when drying to prevent temperature leaking;

● Reduce opening time or keep closing the door of the oven during drying;

● Use anti-static glove to take out module when its temperature below 36℃ by natural cool down after drying;

● Make sure no water and dirt in the bottom of the module;

● Temperature and humidity control is level 3 for initial modules. Storage and drying conditions are based on IPC/JEDEC J-STD-020.

5.4 Storage Condition

Figure 9 Storage Condition