MXCHIP® | 智能硬件解决方案提供商

Datasheet

EMW3080V2

Embedded encryption security Wi-Fi module

Version：1.7 **Date：2018-07-10** **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.
- Wi-Fi Features
  - Support 802.11b/g/n
  - 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℃

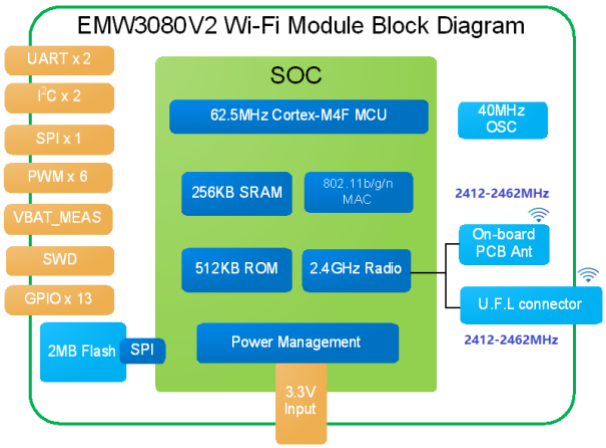
Application

- Intelligent lighting
- Intelligent Transportation
- Smart Home Application
- industrial automation
- Intelligent Security

Module Type

Type	Illustration
EMW3080V2-P	PCB Antenna
EMW3080V2-E	IPEX Antenna

Hardware Block



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
2017-7-11	1.31	Update the pin description of pin notes.
2018-05-28	1.7	Fix some errors and Update the value of intern resistor Update power consumption

Content

Figure Content

Table Content

1. Product Introduction

EMW3080V2 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.

EMW3080V2 runs MXOS 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/Alink1.1/Joinlink3.0/Hilink/OneNet/Gome/Suning, oversea cloud such as AWS/Ayla/Azure/IBM Watson/Google/Apple Homekit. 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

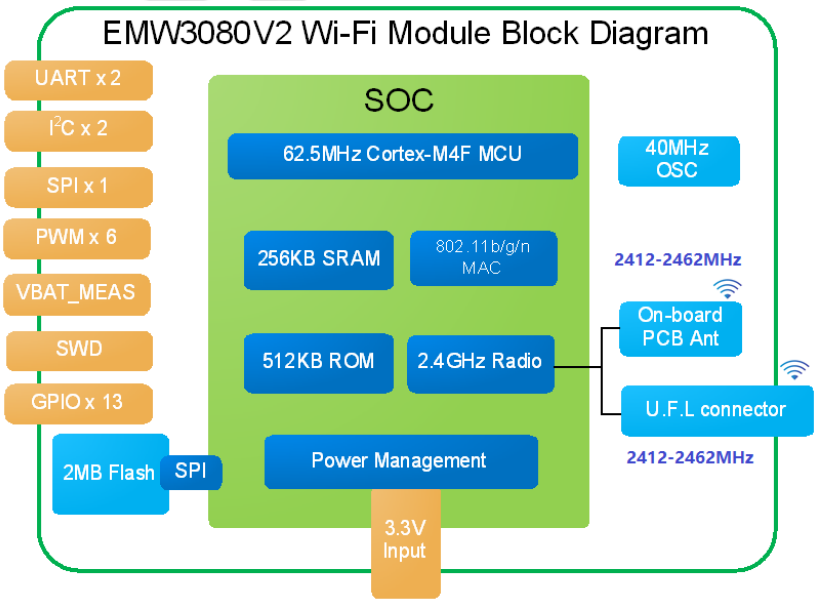


Figure 1 EMW3080V2 Hardware block

1.1 EMW3080V2 Label Information

There are two types of label as following.

Figure 2 EMW3080V2 Label Information

CMIIT ID:XXXXXXXXXX: SRRC approval number

FCC ID:P53-EMW3080V2: FCC certification information

MXCHIP: Company Logo

EMW3080V2-P/-E: Module type, -P is PCB antenna; -E is IPEX antenna

B0F893106220: MAC address (Each module has a unique MAC address)

X1916：Production batch, X is factory code. 19 is production year. 16 is week number.

0000.0000.A213: Production firmware SN series number

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.

1.2 Pin Arrangement

EMW3080V2 has SOH(snap off hole) package and DIP package, DIP package (as shown in figure 2) could effectively reduce the quality risk of second patch；SOH 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.

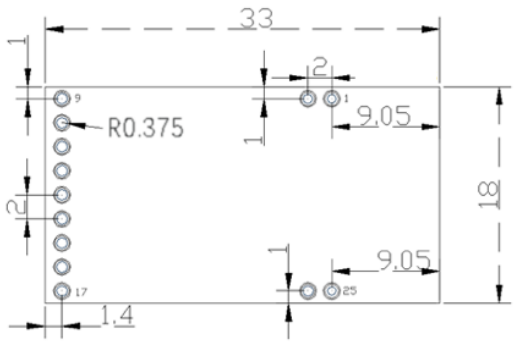
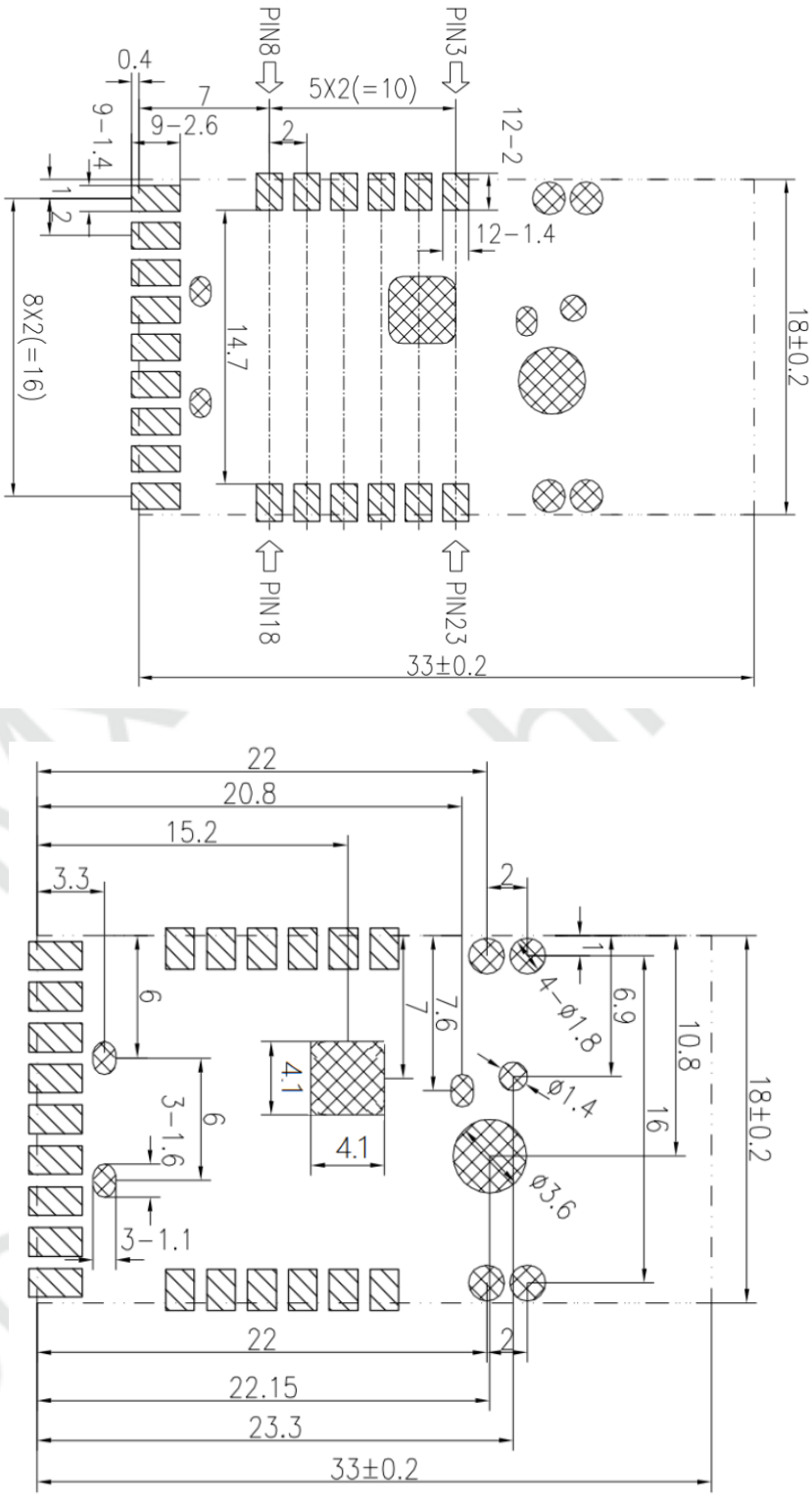


Figure 3 DIP Package Size



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 4 SOH Package Size

1.3 Pin Definition

1.3.1 EMW3080V2 Package Definition

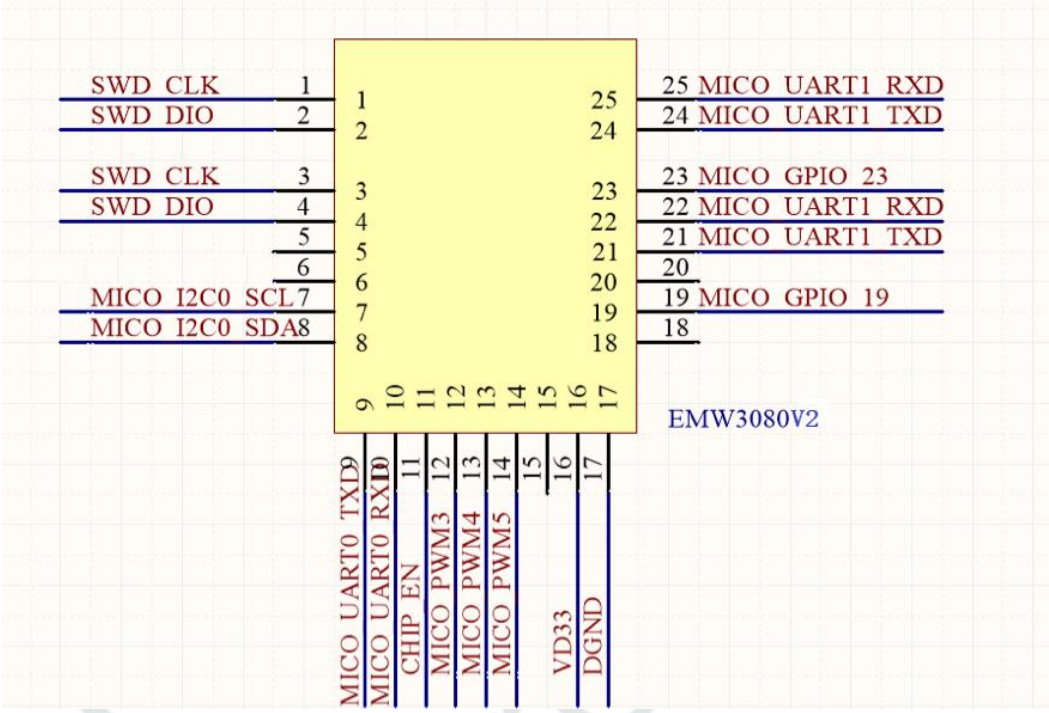


Figure 5 EMW3080V2 Pin Definition

1.3.2 EMW3080V2 Pin Definition

Table 1 EMW3080V2 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, EMW3080V2(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) If not used, please set the pin as NC, especially for CHIP_EN.

(5) Maximum I2C speed 400Kbps.

(6). Support PWM in hardware, maximum speed 2MHz.

(7). Please keep NC for unused pins.

2. Electrical Parameters

2.1 Operating Conditions

EMW3080V2 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 EMW3080V2 Power Consumption

Mode	EMW3080V2 current		Note
	Average	Max	
Wi-Fi off	28.329mA	28.348mA	CPU idle
Wi-Fi off	3.45mA	3.453mA	CPU idle and in low power mode
Wi-Fi off	24.672mA	24.730mA	CPU run at full speed
Wi-Fi Initialize	114.119 mA	121.398 mA	Wi-Fi and MCU low power mode OFF
Wi-Fi Initialize	3.583 mA	11.7 mA	Wi-Fi and MCU low power mode ON
Wi-Fi keep connected with router	114.043 mA	147.086mA	Wi-Fi and MCU low power mode OFF
Wi-Fi keep connected with router	14.005 mA	172.128 mA	Wi-Fi and MCU low power mode ON
SoftAP mode	118.691mA	198.92 mA	

Monitor mode	114.734 mA	122.779mA	Monitor mode for WiFi configuration
Standby mode	10.445 uA	12.07 uA	MCU/RAM/Peripherals/RTC OFF, wake up by IO or internal Timer
Iperf mode	160.001mA	336.61mA	Wi-Fi and MCU low power mode OFF
Iperf mode	164.315mA	332.78mA	Wi-Fi and MCU low power mode ON

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	-40 to +125	℃
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 ℃ , JESD22-A114	2	2000	V
V_{ESD}(CDM)	Electrostatic discharge voltage (Charged Device Model)	TA = +25 ℃ , JESD22-C101	II	500	

3. RF parameters

3.1 Basic RF parameters

Table 7 Radio-frequency standards

Name		Illustration
Working frequency		2412~2462MHz
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
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

Category	**Content**				
Mode	IEEE802.11b				
Channel	CH1 to CH11				
Rate	1, 2, 5.5, 11Mbps				
TX	Minimum	Typ.	Maximum	Unit	
1. Output power	14	16.5	17.02	dBm	
2. Spectrum template					
1) fc +/-11MHz to +/-22MHz	-	-	-30	dBr	
2) fc > +/-22MHz	-	-	-50	dBr	
3. Frequency offset	-15	-2	+15	ppm	

4. EVM(Peak EVM)					
1) 1~11Mbps	-	-	35%		
RX Minimum receiving sensitivity	Minimum	Typ	Maximum	Unit	
1Mbps (FER≦8%)	-	-98	-83	dBm	
11Mbps (FER≦8%)	-	-89	-76	dBm	

3.2.2 Transmit performance of IEEE802.11g mode

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

Category	**Content**				
Mode	IEEE802.11g				
Channel	CH1 to CH11				
Rate	6, 9, 12, 18, 24, 36, 48, 54Mbps				
TX	Minimum	Typ	Maximum	Unit	
1. Output Power	12.5	14.5	15.16	dBm	
2. Spectrum template					
1) at fc +/- 11MHz	-	-	-20	dBr	
2) at fc +/- 20MHz	-	-	-28	dBr	
3) at fc > +/-30MHz			-40	dBr	
3. Frequency offset	-15	-2	+15	ppm	
4. EVM(Peak EVM)					
6Mbps	-	-30	-5	dBm	
54Mbps	-	-31	-25	dBm	
RX Minimum receiving sensitivity	Minimum	Typ	Maximum	Unit	
6Mbps (FER≦10%)	-	-92	-82	dBm	

54Mbps (FER≦10%)	-	-76	-65	dBm	

3.2.3 Transmit performance of IEEE802.11n-HT20 mode

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

Category	**Content**				
Mode	IEEE802.11n HT20				
Channel	CH1 to CH11				
Rate	MCS0/1/2/3/4/5/6/7, Maximum 72.2Mbps				
TX	Minimum	Typ	Maximum	Unit	
1. Output power	11.5	13.5	15.18	dBm	
2. Spectrum template					
1) at fc +/- 11MHz	-	-	-20	dBr	
2) at fc +/- 20MHz	-	-	-28	dBr	
3) at fc > +/-30MHz			-45	dBr	
3. Frequency offset	-15	-2	+15	ppm	
4. EVM(Peak EVM)					
MCS0	-	-30	-5	dBm	
MCS7	-	-32	-27	dBm	
RX Minimum receiving sensitivity	Minimum	Typ	Maximum	Unit	
MCS0 (FER≦10%)	-	-92	-82	dBm	
MCS7 (FER≦10%)	-	-73	-64	dBm	

Category	**Content**

Mode					
Channel					
Rate					
TX	Minimum	Typ	Maximum	Unit	
1. Output power				dBm	
2. Spectrum template					
1) at fc +/- 22MHz				dBr	
2) at fc +/- 40MHz				dBr	
3) at fc > +/-60MHz				dBr	
3. Frequency offset				ppm	
4. EVM(Peak EVM)					
MCS0				dBm	
MCS7				dBm	
RX Minimum receiving sensitivity	Minimum	Typ	Maximum	Unit	
MCS0 (FER≦10%)				dBm	
MCS7 (FER≦10%)				dBm	

4. Antenna Information

4.1 Antenna Type

EMW3080V2 has two type of antenna: EMW3080V2-P and EMW3080V2-E

EWM3080V2-E EMW3080V2-P

Figure 6 Antenna Type

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.

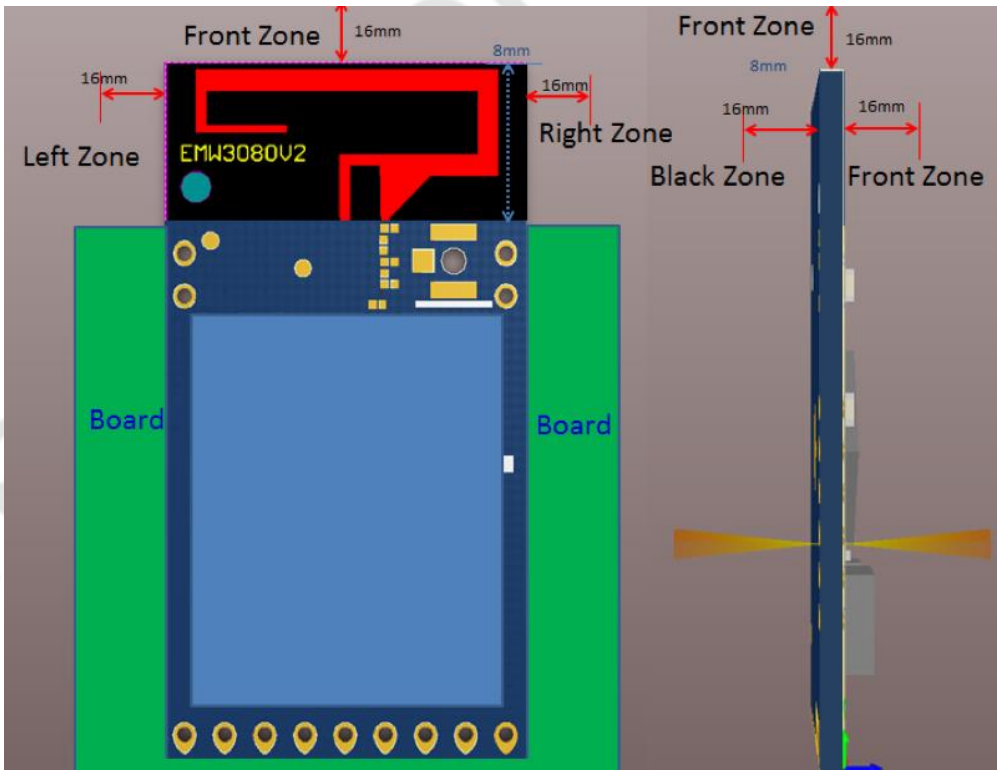


Figure 7 Minimum Clearance Zone of PCB Antenna (Unit: mm)

4.3 External Antenna Connector

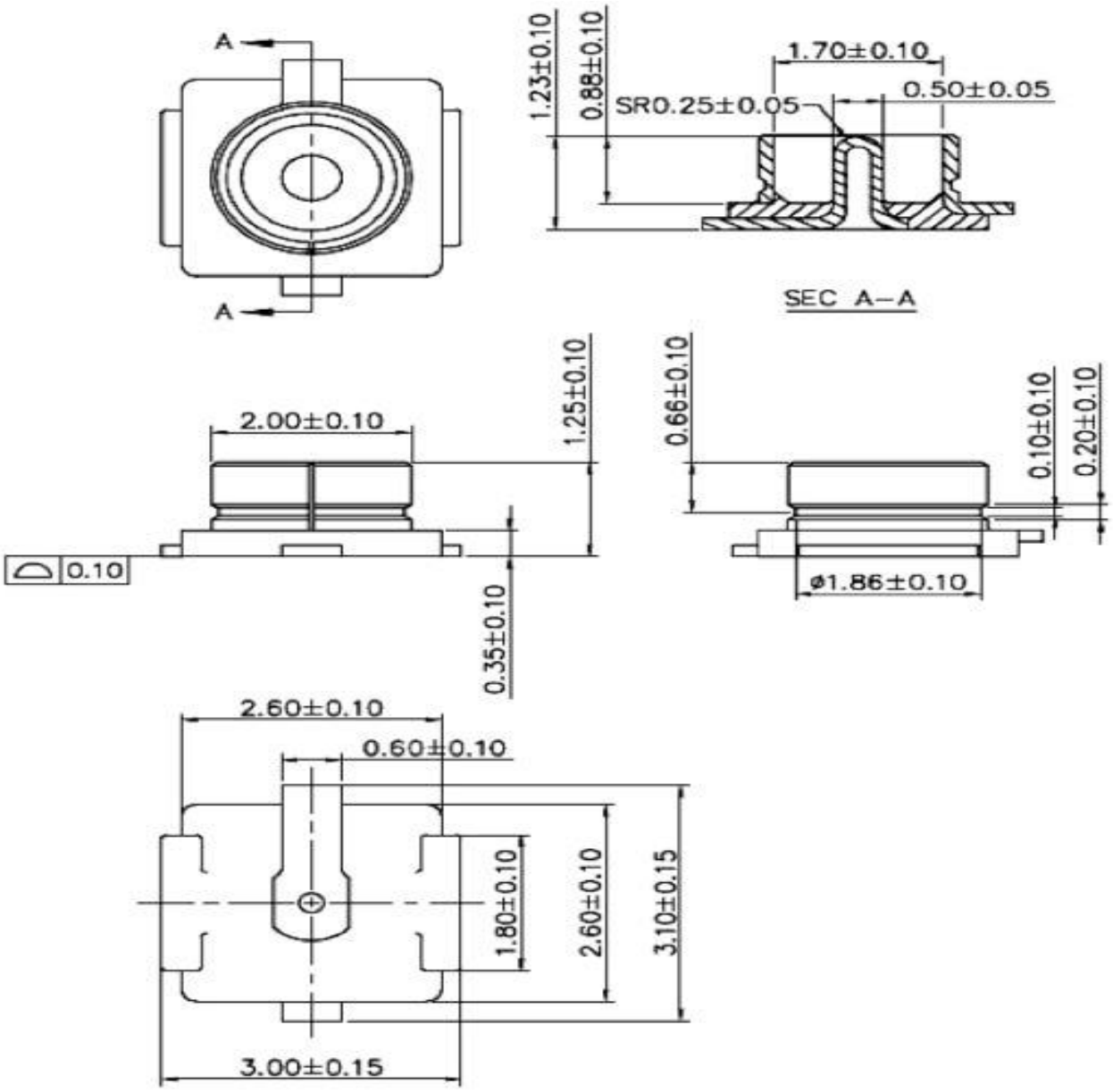
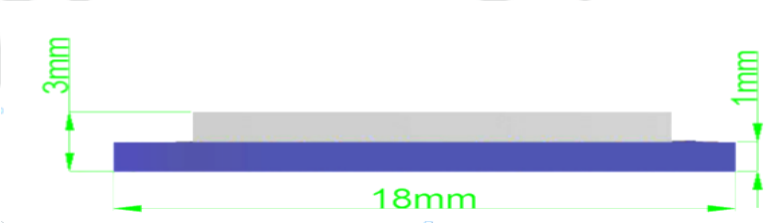


Figure 8 Size of External Antenna Connector

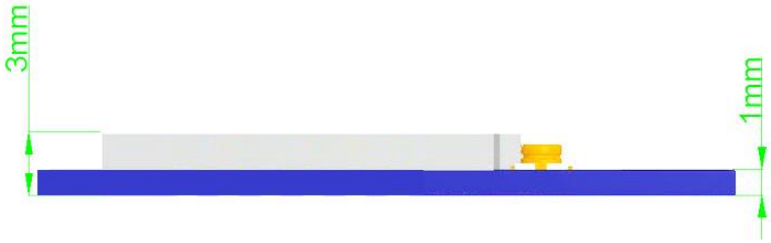
5. Assembly Information and Production Guidance

5.1 Assembly Size

Top View



Left Side View



Side View

Figure 9 EMW3080V2 Side 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 11:

- 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 10 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

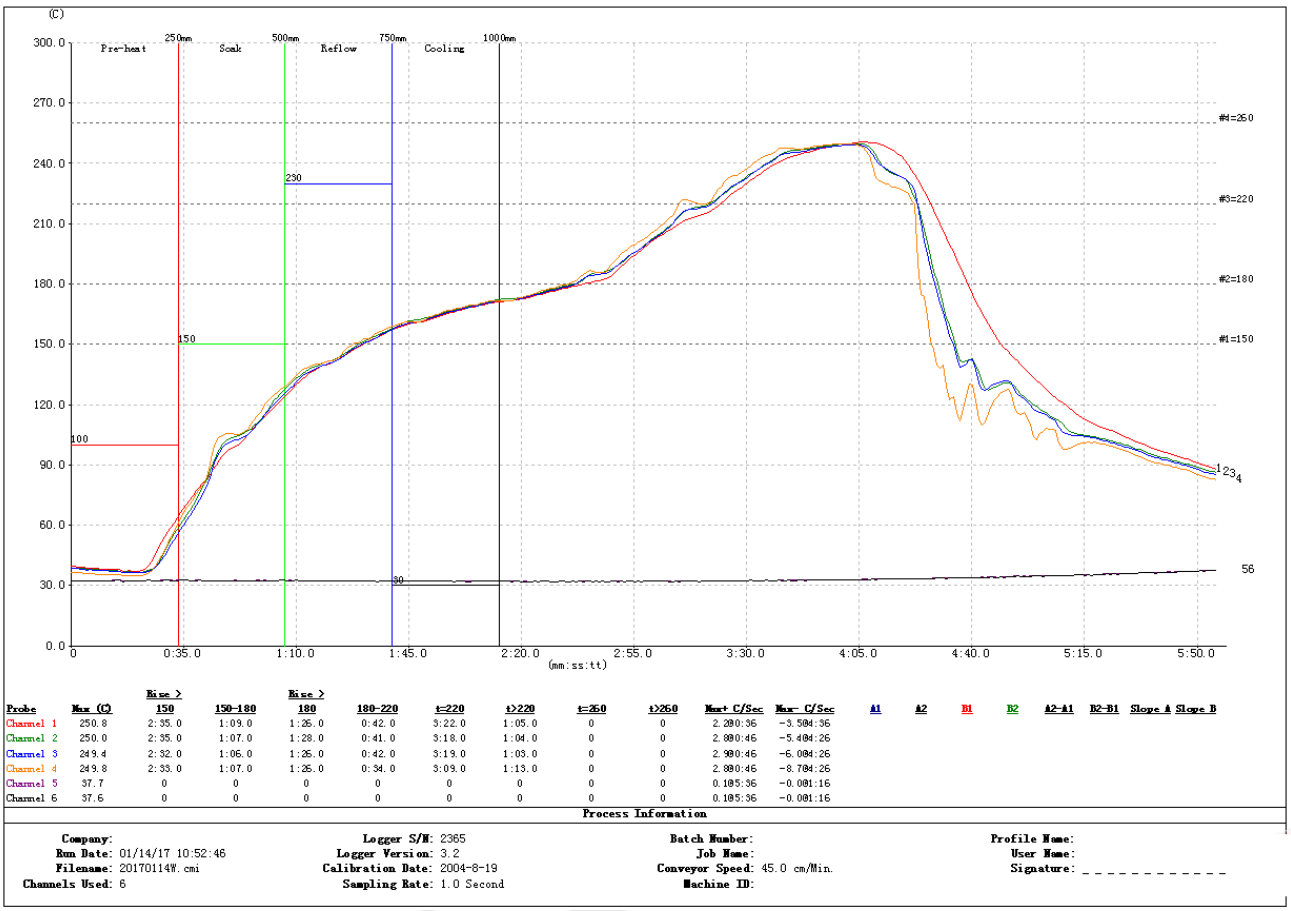
- Operator should wear anti-static gloves during producing;
- No more than drying time;
- Any explosive, flammable and corrosive material is not allowed to add in drying;
- Module should be put into oven with high thermotolerant tray. Ventilation should exist between each module and no direct contact 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 11 Storage Condition

5.5 Temperature Curve of Secondary Reflow

Suggested solder paste type: SAC305, unleaded, solder paste thickness from 0.12 to 0.15, less than 2 times reflow.



Probe	Max (C)	Rise > 150	150-180	Rise > 180	180-220	t>220	t>220	t>250	t>250	Max+ C/Sec	Max- C/Sec	A1	A2	B1	B2	A2-A1	B2-B1	Slope A	Slope B
Channel 1	250.8	2:35.0	1:09.0	1:26.0	0:42.0	3:22.0	1:05.0	0	0	2.280:36	-3.504:36								
Channel 2	250.0	2:35.0	1:07.0	1:28.0	0:41.0	3:18.0	1:04.0	0	0	2.880:46	-5.404:26								
Channel 3	249.4	2:32.0	1:06.0	1:26.0	0:42.0	3:19.0	1:03.0	0	0	2.980:46	-6.004:26								
Channel 4	249.8	2:33.0	1:07.0	1:26.0	0:34.0	3:09.0	1:13.0	0	0	2.880:46	-8.704:26								
Channel 5	37.7	0	0	0	0	0	0	0	0	0.105:36	-0.001:16								
Channel 6	37.6	0	0	0	0	0	0	0	0	0.105:36	-0.001:16								

Process Information

Company:	Logger S/N: 2365	Batch Number:	Profile Name:
Run Date: 01/14/17 10:52:46	Logger Version: 3.2	Job Name:	User Name:
Filename: 20170114W.cmi	Calibration Date: 2004-8-19	Conveyor Speed: 45.0 cm/Min.	Signature: _____
Channels Used: 6	Sampling Rate: 1.0 Second	Machine ID:	

Figure 12 Temperature Curve of Secondary Reflow

6. Reference Circuit

Power source circuit is shown in Figure 13, USB to UART is shown in Figure 14, external interface circuit is shown in Figure 15.

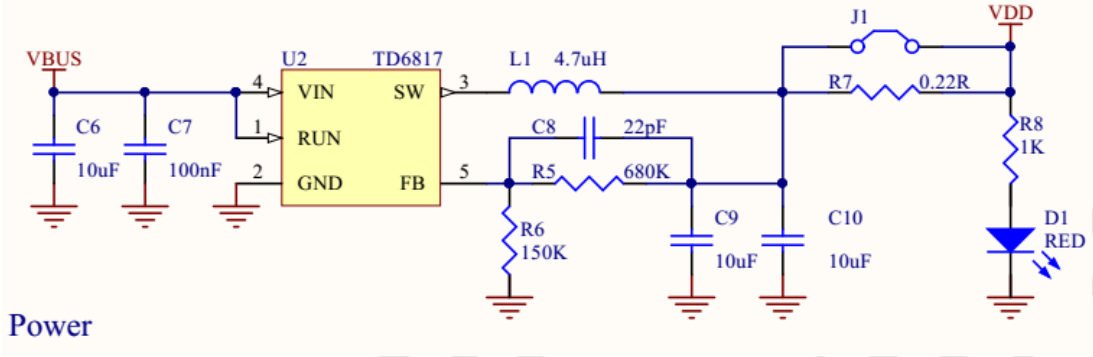


Figure 13 Power Source Circuit

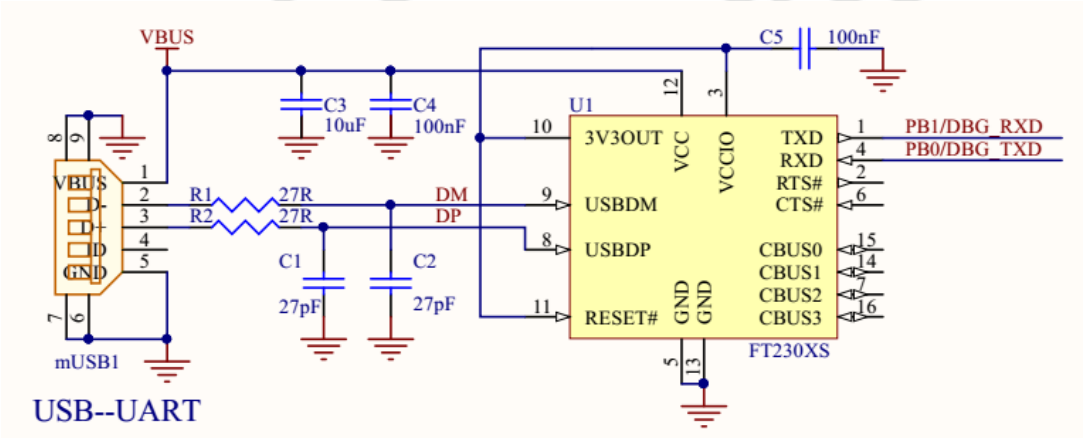


Figure 14 USB to UART

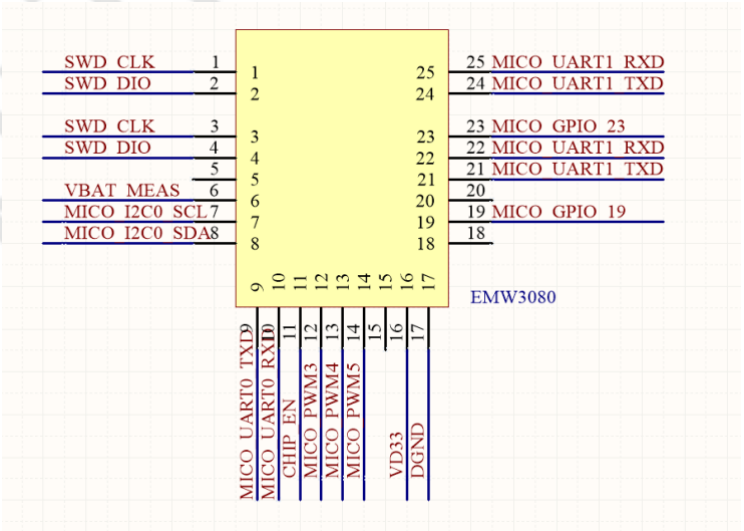


Figure 15 External Interface Circuit of EMW3080V2

Voltage of EMW3080V2 UART is 3.3V. 5V UART should convert to 3.3V UART for the users that have 5V chips.

Convert circuit is shown in Figure 16.

Note: Inside module, pin 21 MICO_UART1_TXD has 100k weak pull-up resistor, as well as pin 22 MICO_UART1_RXD. MICO_PWM3 has 100k pull-down resistor. CHIP_EN has 100k pull-up resistor and 0.01uF earth capacity. Please pay special attention to the design schematics and PCB, allocate the pull-up and pull-down resistance according to the internal hardware.

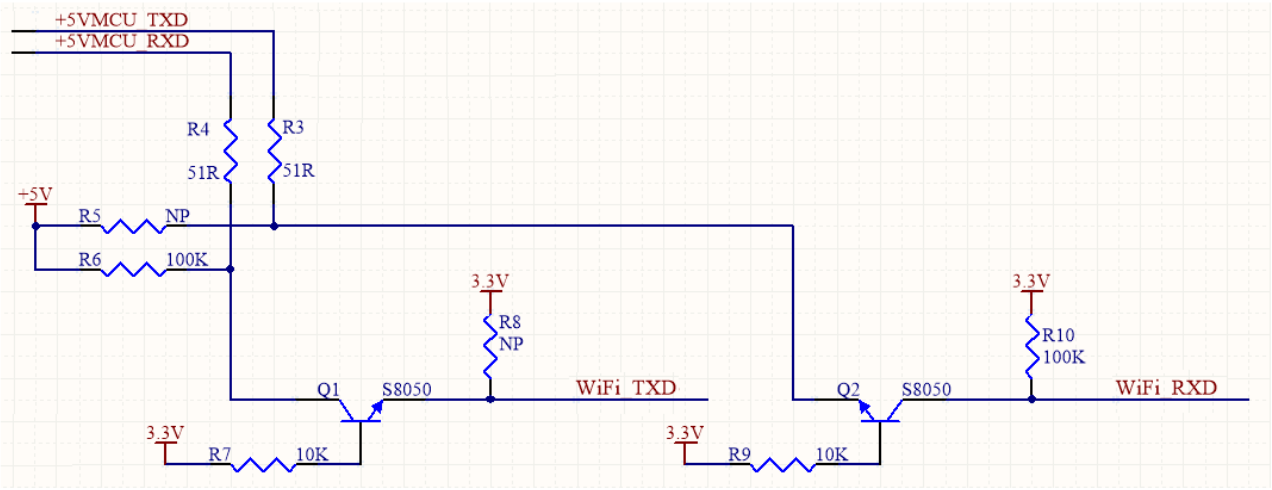


Figure 16 3.3V UART- 5V UART Convert Circuit

7. Module MOQ and Package Information

Table 12 Module MOQ and Package Information

Type	MOQ(pcs)	Shipping packing method（Tray/Tape）	Module storage quantity for each tray (pcs)	Tray number for each box	Module quantity for each box (pcs)
EMW3080V2-P EMW3080V2-E	1050（2 boxes）	Tray	35	15+1	525

8. FCC & IC Information

8.1 FCC Warning

Any 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.

The device has been evaluated to meet general RF exposure requirement.

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.

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

8.2 IC warning

- English:

This device complies with Industry Canada licence-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.

- French:

Le présentappareilestconforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitationestautorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareildoit accepter tout brouillageradioélectriquesubi, mêmesi le brouillageest susceptible d'encompromettre le fonctionnement.

9. Sales Information and Technical Support

For consultation or purchase the product, please contact Mxchip during working hours:

From Monday to Friday, morning 9:00~12:00, afternoon 13:00~18:00

Telephone: +86-21-52655026

Contact address: 9tshFloor, No.5, Lane2145 JinshaJiang Road Putuo District, ShangHai.

Postcode：200333

Email: sales@mxchip.com

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 Transmitter Module FCC ID: P53-EMW3080V2" or "Contains FCC ID: P53-EMW3080V2."