

EMW3080V2

Embedded Wi-Fi module

Version: 1.3

Date: 2018-09-11

Number: DS0122EN

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, 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°C to +85°C

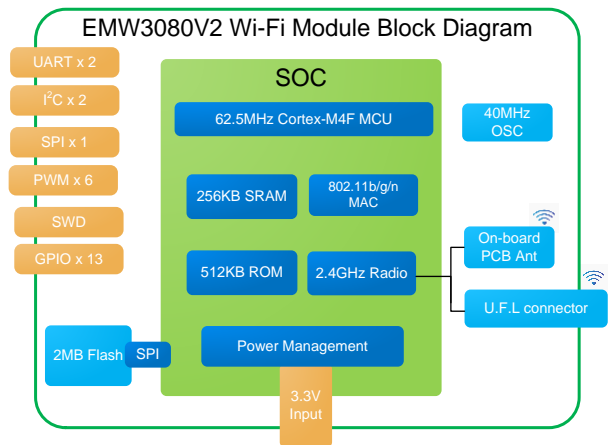
Application

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

Module Type

Part number	Note
EMW3080V2-P	PCB antenna
EMW3080V2-E	IPEX connector

Hardware Block



EMW3080V2

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Version History

Date	Version	Details
2018-05-17	1.0	Initial release
2018-07-10	1.1	Update storage temperature Specific internal pull-up and pull-down capacitors Update power consumption
2018-08-23	1.2	Add IO status information when boot up in section 1.3.2
2018-09-11	1.3	Deleted hardware block about Vbatmes function

Content

Abstract	1
Version History	1
1. Product Introduction	4
1.1 EMW3080V2 LABEL INFORMATION	6
1.2 PIN ARRANGEMENT	6
1.3 PIN DEFINITION	8
1.3.1 EMW3080V2 Package Definition.....	8
1.3.2 EMW3080V2 Pin Definition.....	8
2. Electrical Parameters	11
2.1 OPERATING CONDITIONS	11
2.2 POWER CONSUMPTION	11
2.3 WORKING ENVIRONMENT.....	12
2.4 ELECTROSTATIC DISCHARGE	12
3. RF parameters	13
3.1 BASIC RF PARAMETERS	13
3.2 TX PERFORMANCE	13
3.2.1 Transmit performance of IEEE802.11b mode	13
3.2.2 Transmit performance of IEEE802.11g mode	14
3.2.3 Transmit performance of IEEE802.11n-HT20 mode	15
4. Antenna Information	16
4.1 ANTENNA TYPE	16
4.2 PCB ANTENNA CLEARANCE ZONE	16
4.3 EXTERNAL ANTENNA CONNECTOR.....	17
5. Assembly Information and Production Guidance	18
5.1 ASSEMBLY SIZE	18
5.2 PRODUCTION GUIDANCE	18
5.3 CONSIDERATIONS.....	20
5.4 STORAGE CONDITION	21
5.5 TEMPERATURE CURVE OF SECONDARY REFLOW.....	22
6. Reference Circuit	23
7. Module MOQ and Package Information	25
8. Sales Information and Technical Support	26

Figure Content

Figure 1 EMW3080V2 Label Information	6
Figure 2 DIP Package Size	7
Figure 3 SOH Package Size.....	8
Figure 4 EMW3080V2 Package Definition.....	8

Figure 5 Minimum Clearance Zone of PCB Antenna (Unit: mm)	16
Figure 6 Size of External Antenna Connector	17
Figure 7 EMW3080V2 Side View (Unit: mm).....	18
Figure 8 Humidity Card.....	19
Figure 9 Storage Condition.....	21
Figure 10 Temperature Curve of Secondary Reflow	22
Figure 11 Power Source Circuit.....	23
Figure 12 USB to UART	23
Figure 13 External Interface Circuit of EMW3080V2	24
Figure 14 3.3V UART- 5V UART Convert Circuit.....	24

Table Content

Table 1 EMW3080V2 Pin Definition	8
Table 2 Range of input voltage	11
Table 3 Absolute maximum voltage rating	11
Table 4 EMW3080V2 Power Consumption	11
Table 5 Temperature and humidity condition	12
Table 6 Electrostatic Discharge Parameters.....	12
Table 7 Radio-frequency standards.....	13
Table 8 CCK_11 transmit performance parameters of IEEE802.11b mode	13
Table 9 OFDM_54 transmit performance parameters of IEEE802.11g mode.....	14
Table 10 MCS7 transmit performance parameters of IEEE802.11n-HT20 mode	15

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 62.5MHz 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.

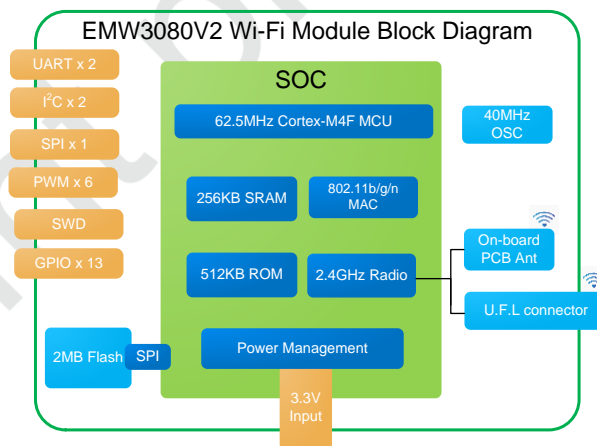
Hardware diagram is shown below with four main parts:

- CM4F main core
- WLAN MAC/BB/RF/ANT
- Hardware encryption
- Power management

With:

1. ARM CM4F CPU with 62.5MHz 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

EMW3080V2 Hardware block



	EMW3080V2V2
Core	ARM CM4F
CPU frequency	62.5MHz
RAM	256KB
Flash(QSPI 100MHz)	2MB (support XIP CACHE)
UART (Max 6Mbps)	2
I2C (400KHz)	2
SPI (31.25MHz)	1
PWM (Max 4MHz)	6
SWD	1
Debug UART	1
GPIO(drive current 4mA)	13

1.1 EMW3080V2 Label Information



Figure 1 EMW3080V2 Label Information

Label Information:

CMIIT ID:2017DP1516 : SRRC approval number

FCC ID:P53-EMW3080V2 :FCC certification information

CE: CE authentication log

EMW3080: Main module type

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

F3080V2BP: Sub model type, PCB antenna or IPEX

X1701: production batch

0000.0000.AT08 : SN series number

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.

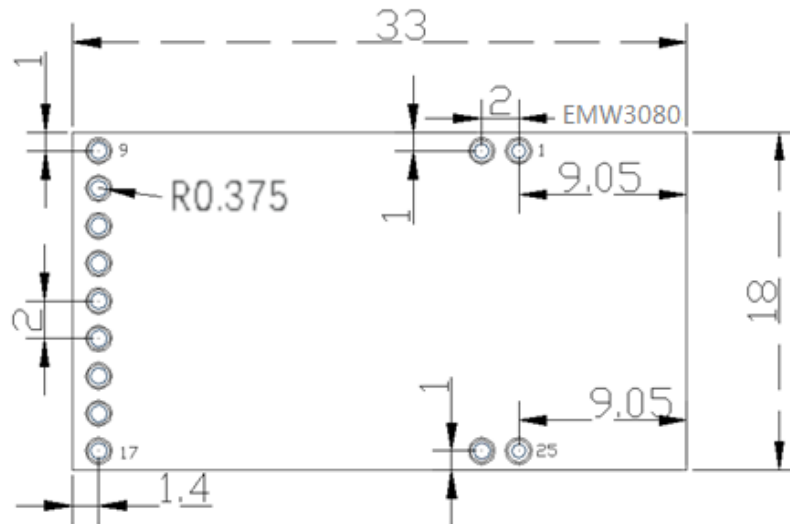
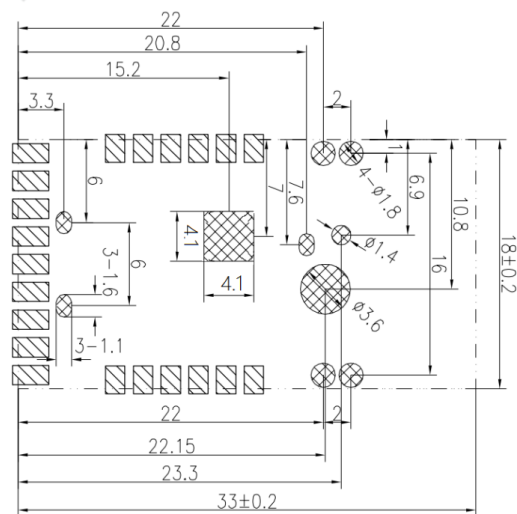
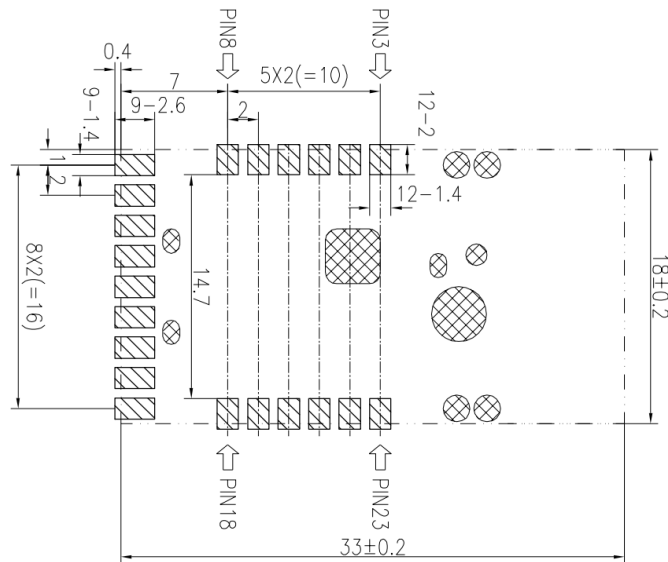


Figure 2 DIP Package Size



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 SOH Package Size

1.3 Pin Definition

1.3.1 EMW3080V2 Package Definition

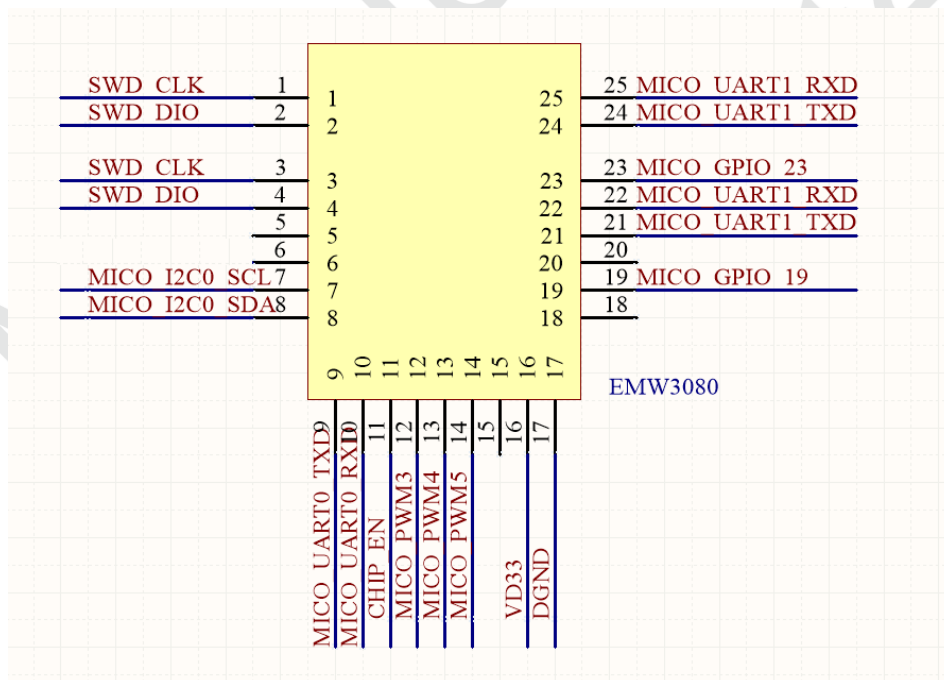


Figure 4 EMW3080V2 Package Definition

1.3.2 EMW3080V2 Pin Definition

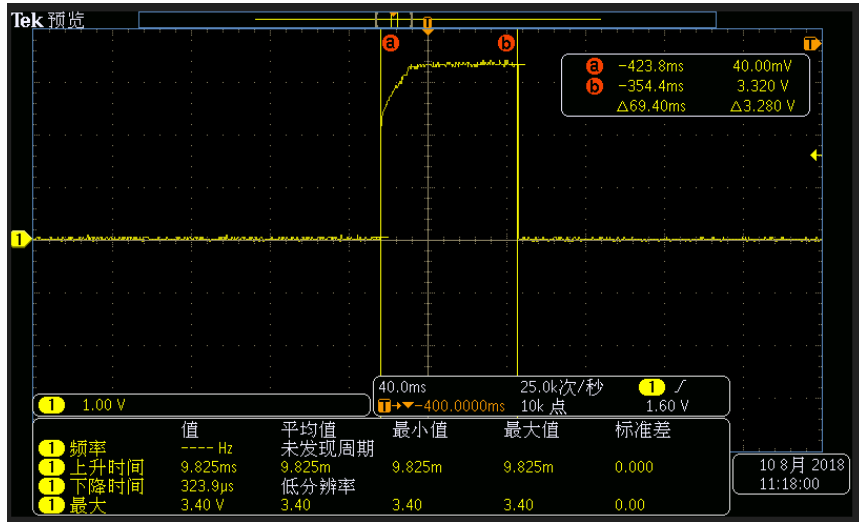
Table 1 EMW3080V2 Pin Definition

NO.	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) 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.
- (2) PIN21/24 should be in high voltage or NC when power on, please aware it when designing circuit.
- (3) If not used, please set the pin as NC, especially for CHIP_EN.
- (4) Maximum I2C speed 400Kbps.
- (5) Support PWM in hardware, maximum speed 2MHz.
- (6) Please keep NC for unused pins.
- (7) Note that IOs are in floating mode while module boot up running ROM code, and the internal pull-up or pull-down will not take effect until boot code is running. The floating time will be affected by flash. So if the IO need be in a certain status while module boot up, an external pull-up or pull-down resistor is needed, and the resistance should be less than 100Kohm. Please refer to the below picture, the IO is set as low, and from a point to b point it's in floating mode and be pulled up by an external 100k resistor.



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	20.903mA	21.209mA	CPU idle
Wi-Fi off	3.704mA	3.450mA	CPU idle and in low power mode
Wi-Fi off	19.610mA	20.295mA	CPU run at full speed
Wi-Fi initialization	110.603mA	126.092mA	Wi-Fi and MCU low power mode OFF
Wi-Fi keep connected with router	109.447 mA	124.086 mA	Wi-Fi and MCU low power mode OFF
Wi-Fi keep connected with router	9.059 mA	282.791 mA	Wi-Fi and MCU low power mode ON
SoftAP	116.698 mA	306.078 mA	SoftAP
Monitor	114.699mA	126.954mA	Monitor mode for WiFi configuration

Standby	4.642 uA	20.323 uA	MCU/RAM/Peripherals/RTC OFF, wake up by IO or internal Timer
Iperf	115.697mA	345.190mA	Wi-Fi and MCU low power mode OFF
Iperf	115.030mA	353.832mA	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	°C
TA	Operation Temperature	-20 to +85	°C
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
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 CH13				
Rate	1, 2, 5.5, 11Mbps				
TX	Minimum	Typ.	Maximum	Unit	
1. Output power	14	16.5	18.5	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 \leq 8%)	-	-98	-83	dBm	
11Mbps (FER \leq 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 CH13				
Rate	6, 9, 12, 18, 24, 36, 48, 54Mbps				
TX	Minimum	Typ	Maximum	Unit	
1. Output Power	12.5	14.5	16.5	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 \leq 10%)	-	-92	-82	dBm	
54Mbps (FER \leq 10%)	-	-76	-65	dBm	

3.2.3 Transmit performance of IEEE802.11n-HT20 mode

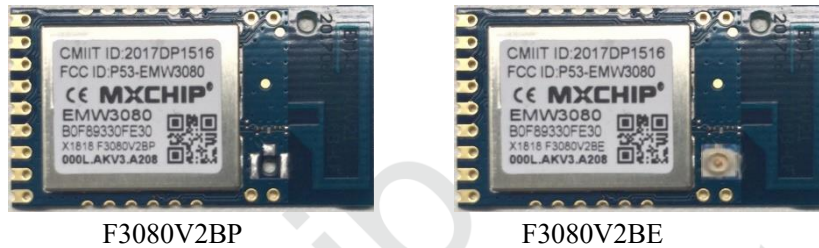
Table 10 MCS7 transmit performance parameters of IEEE802.11n-HT20 mode

Category	Content				
Mode	IEEE802.11n HT20				
Channel	CH1 to CH13				
Rate	MCS0/1/2/3/4/5/6/7, Maximum 72.2Mbps				
TX	Minimum	Typ	Maximum	Unit	
1. Output power	11.5	13.5	15.5	dBm	
2. Spectrum template					
1) at $f_c \pm 11\text{MHz}$	-	-	-20	dBr	
2) at $f_c \pm 20\text{MHz}$	-	-	-28	dBr	
3) at $f_c > \pm 30\text{MHz}$			-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 \leq 10%)	-	-92	-82	dBm	
MCS7 (FER \leq 10%)	-	-73	-64	dBm	

4. Antenna Information

4.1 Antenna Type

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



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.

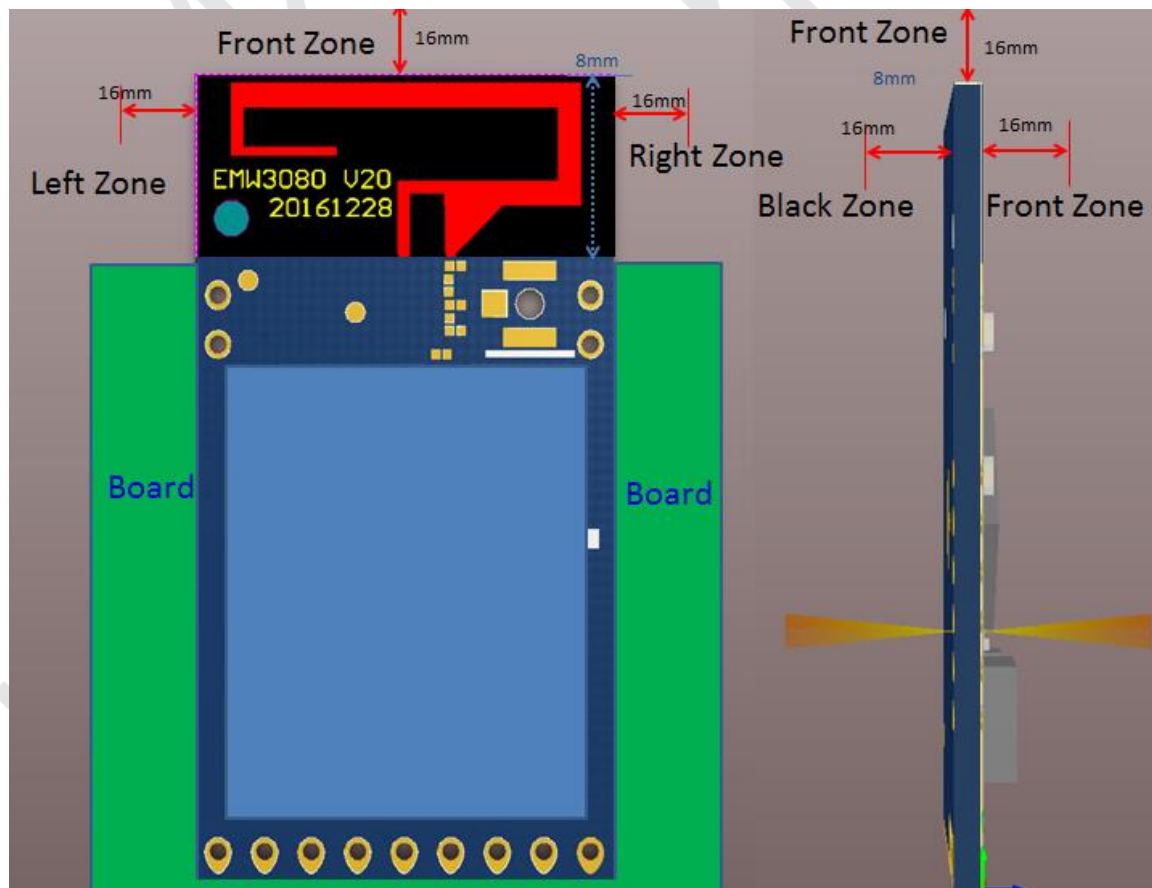


Figure 5 Minimum Clearance Zone of PCB Antenna (Unit: mm)

4.3 External Antenna Connector

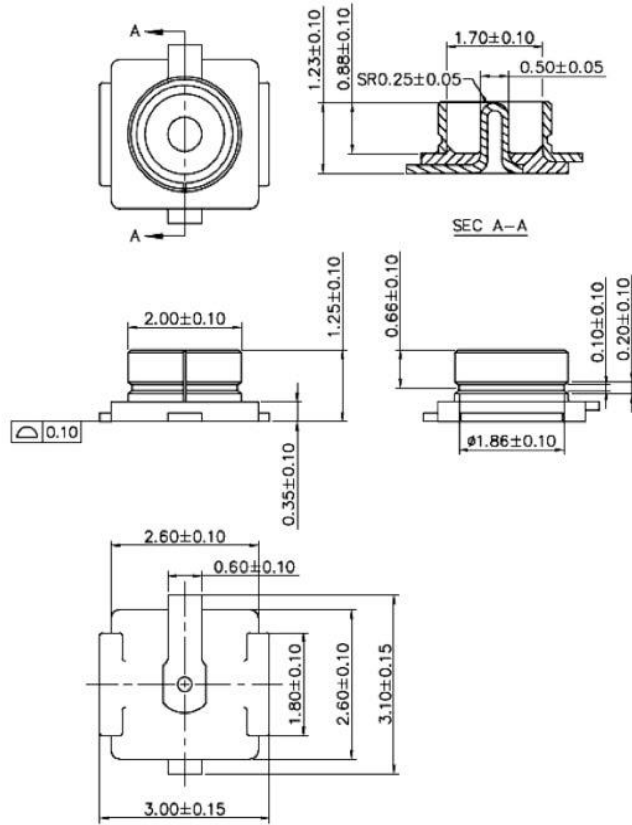
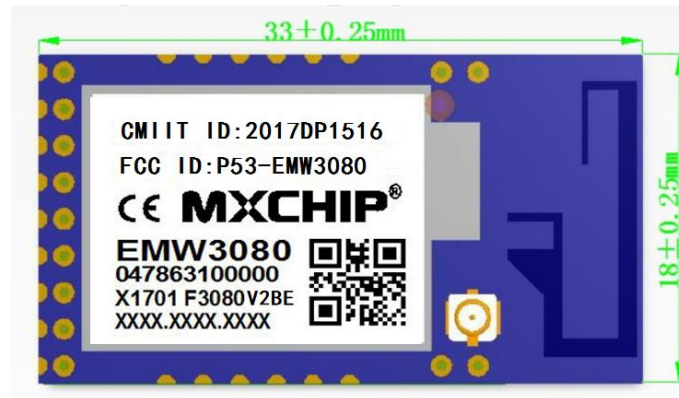


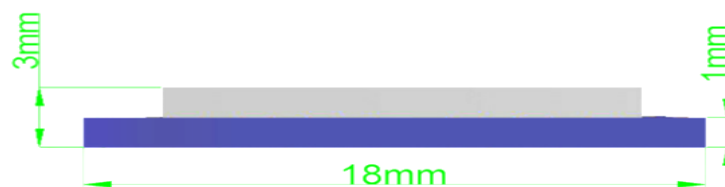
Figure 6 Size of External Antenna Connector

5. Assembly Information and Production Guidance

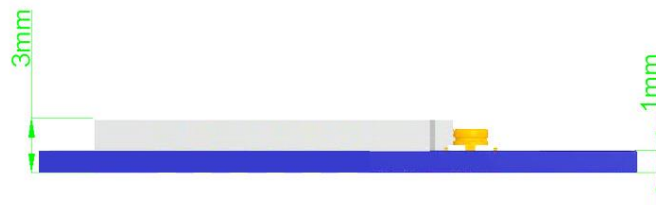
5.1 Assembly Size



Top View



Left Side View



Side View

Figure 7 EMW3080V2 Side View (Unit: mm)

5.2 Production Guidance

- 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: $125^{\circ}\text{C} \pm 5^{\circ}\text{C}$;
 - Alarm temperature: 130°C ;
 - SMT patch when the device cool down below 36°C 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°C , 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°C 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


	CAUTION This bag contains MOISTURE-SENSITIVE DEVICES	LEVEL <div style="border: 1px solid black; padding: 5px; display: inline-block;"> 3 </div>
	If Blank, see adjacent bar code label	
1. Calculated shelf life in sealed bag: 12 months at < 40°C and < 90% relative humidity (RH)		
2. Peak package body temperature: _____ 260 _____ °C <small style="margin-left: 150px;">If Blank, see adjacent bar code label</small>		
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must		
a) Mounted within: _____ 168 _____ hrs. of factory conditions <small style="margin-left: 100px;">If Blank, see adjacent bar code label</small>		
≤ 30°C/60%RH, OR		
b) Stored at <10% RH		
4. Devices require bake, before mounting, if:		
a) Humidity Indicator Card is > 10% when read at 23 ± 5°C		
b) 3a or 3b not met.		
5. If baking is required, devices may be baked for 48 hrs. at 125 ± 5°C		
Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure		
Bag Seal Date: _____ <small style="margin-left: 150px;">If Blank, see adjacent bar code label</small>		
Note: Level and body temperature defined by IPC/JEDEC J-STD-020		

Figure 9 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.

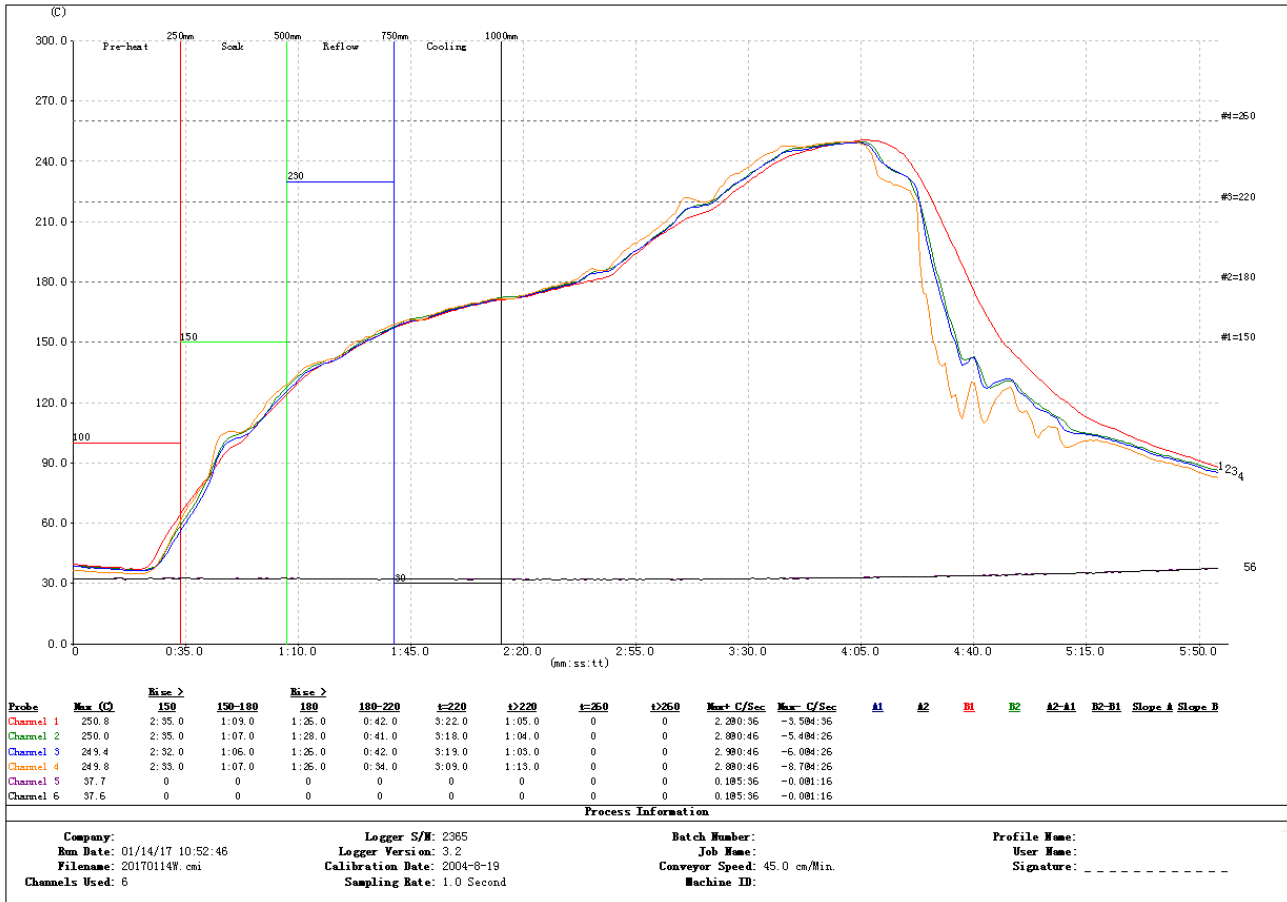


Figure 10 Temperature Curve of Secondary Reflow

6. Reference Circuit

Power source circuit is shown in figure 11, USB to UART is shown in figure 12, external interface circuit is shown in figure 13.

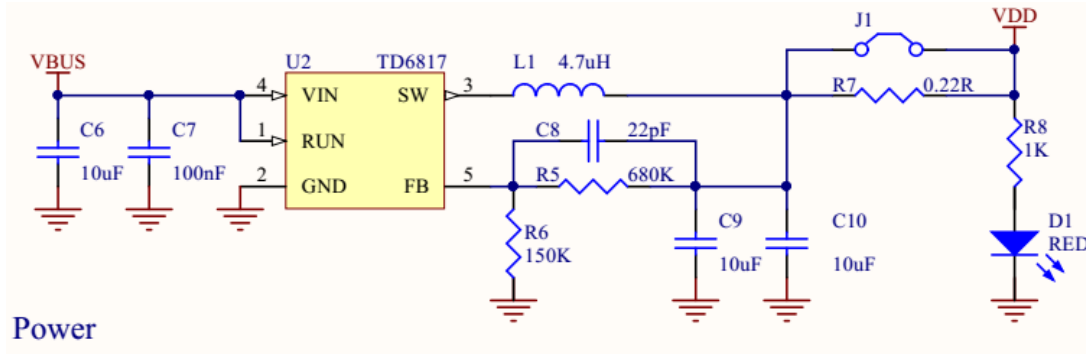


Figure 11 Power Source Circuit

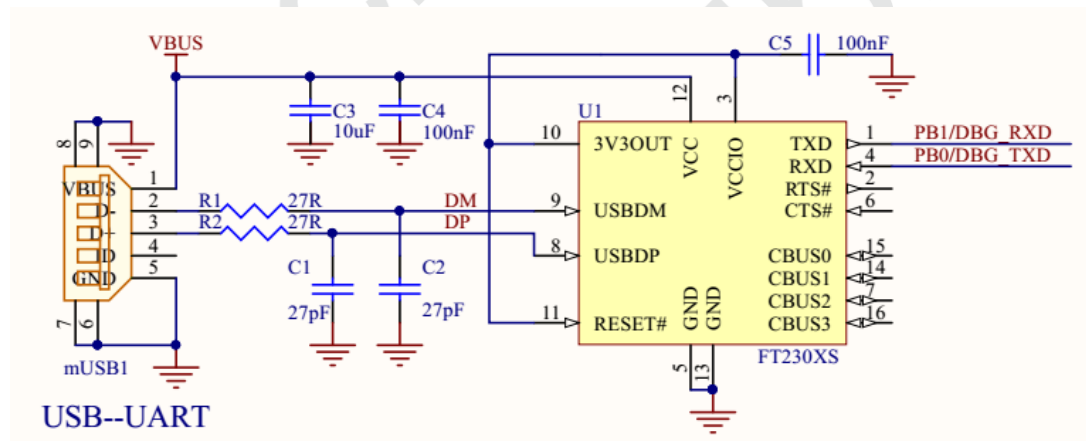


Figure 12 USB to UART

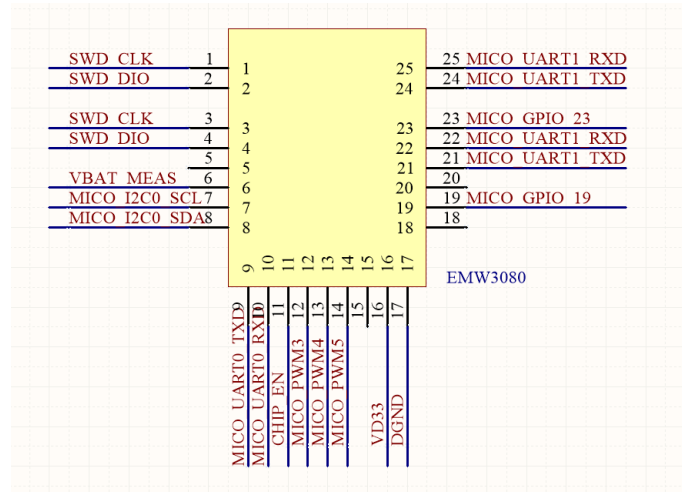


Figure 13 External Interface Circuit of EMW3080V2

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 14.

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.

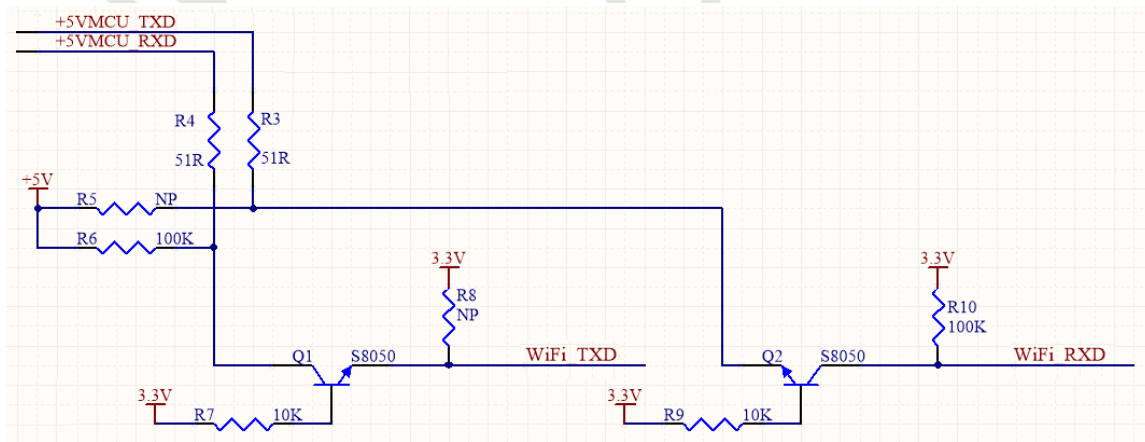


Figure 14 3.3V UART- 5V UART Convert Circuit

7. Module MOQ and Package Information

Table 16 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. 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

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Postcode: 200333

Email: sales@mxchip.com

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