EMW3031

Data Sheet

Embedded Wi-Fi module

V1.2　　　　**Date：2017-11-28**　　　　**NO:DS0050EN**

Overview

Features:

- Cortex-M4 MCU
  - Cortex-M4 core at 100MHz
  - 2M bytes flash
  - 192K bytes RAM
- Operation voltage: DC 2.66V-3.6V
- 20MHz Bandwidth with maximum data rate at 72.2Mbps
- Peripherals
  - Up to 24 GPIOs
  - 3x HS UART
  - 2x I2C
  - 2x SPI
  - 1x SWD
  - 6x PWM
  - 8x ADC
  - 2x DAC
  - 2x I2S
  - 2x WAKEUP PIN
- Wi-Fi connectivity
  - 802.11 b/g/n available
  - WEP, WPA/WPA2 available
  - Station, Soft AP and Station + Soft AP
  - Easylink available
  - On-board PCB antenna and IPEX connector for external antenna
  - CE, FCC compliant
- Operation Temperature: -30°C~+85°C

Application

- Smart LED
- Smart home appliances
- Medical/Health care
- Industrial automation systems
- Point of Sale system

- Auto electronics

Product list:

Part number	Antenna type	Description
EMW3031-P	PCB antenna	Default
EMW3031-E	IPX antenna	Optional

Hardware block:

EMW3031 Wi-Fi Module Block Diagram

UART
SPI
I2C
I2S
ADC
DAC
PWM
GPIO
SWD

SOC

100MHz Cortex-M4F MCU

38.4MHz OSC

RAM 192KB

802.11b/g/n MAC

ROM 128KB

2.4GHz Radio

On-board PCB Ant

U.F.L connector

1.2V LDO/1.8VLDO

Flash 2MB　SPI

3.3V Input
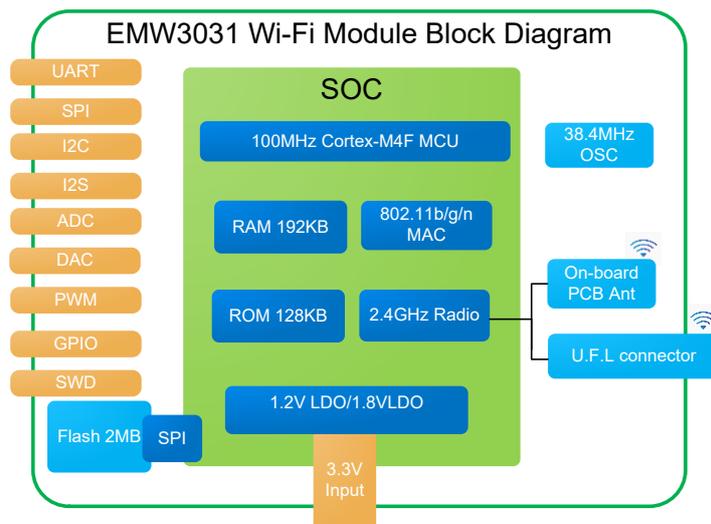
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Version Record

Date	Version	Update content
2015-9-23	0.1	Initial version
2016-9-26	1.0	Release version
2016-12-13	1.1	Update pinmux : FUN4 of A1 and A2
2017-11-28	1.2	Update moedle height

Catalog

Picture Catalog

Table Catalog

1. Introduction

EMW3031 is one embedded Wi-Fi module designed by MXCHIP of low-power, small-size and low-cost. It integrates one 100MHz Cortex-M4 microcontroller of 192Kbytes RAM with another 2Mbytes on-board SPI flash added. Various peripheral interfaces of analog and digital are available. The WLAN chip has two options, one is with PCB antenna and the other one is with external antenna. It supports low power mode and rapid wakeup mode. MCU and WLAN chip have individual low power modes to meet kinds of applications.Product appearance.

The module runs MICO, which is the IOT OS System of MXCHIP, and is available for secondary development. The TCP/IP protocols and security encryption algorithm could be applied in various Wi-Fi applications. In addition, several particular firmware are reserved for some typical applications, like UART to Wi-Fi DTU, easylink configuration and services for cloud interfacing.

It includes four parts from hardware block:

- Cortes-M4 Core
- WLAN MAC/BB/RF/ANT
- Peripherals
- Power supply
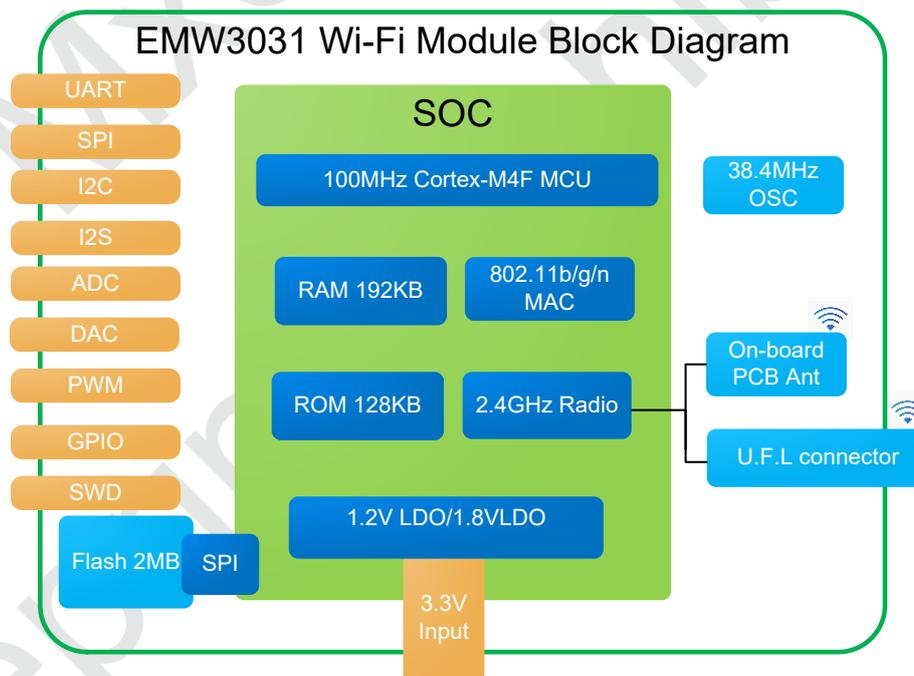
Figure 1 Hardware

1.1   EMW3031 Label

Figure 2 EMW3031 Appearance

Label note:

Label note:

EMW3031-P/ EMW3031-E: Module type

CMIIT ID: XXXXXXXX: SRRC number

D0BAE4500000: MAC address

0000.0000.00002: Firmware version

F3031X-B1/F3031X-W1: Product number

X1605: Production batch number

1.2   Pinouts

EMW3031 provides two solutions for hand-soldering: DIP and half-hole footprint.
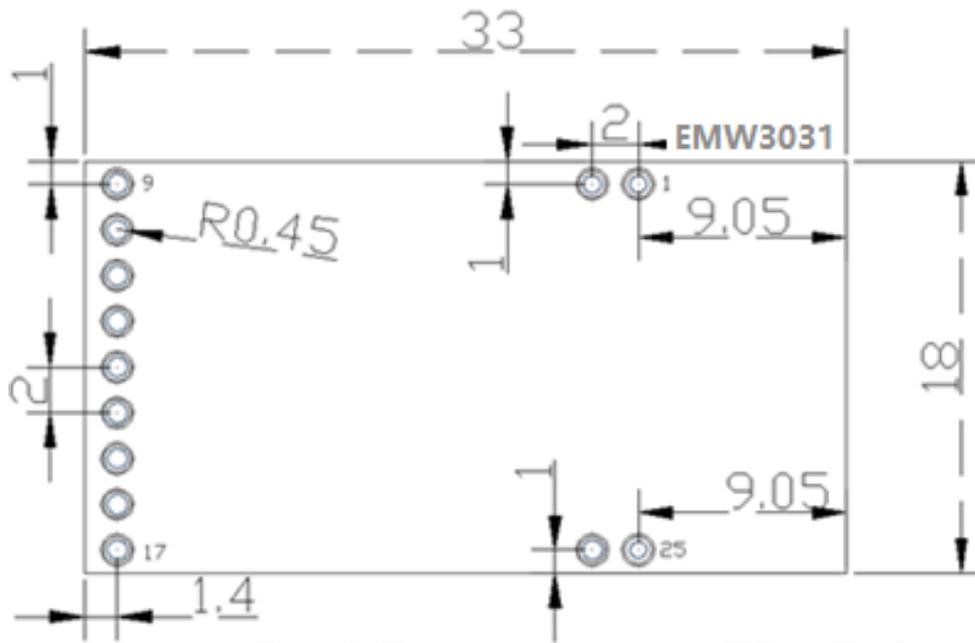
Figure 3 EMW3031 Package
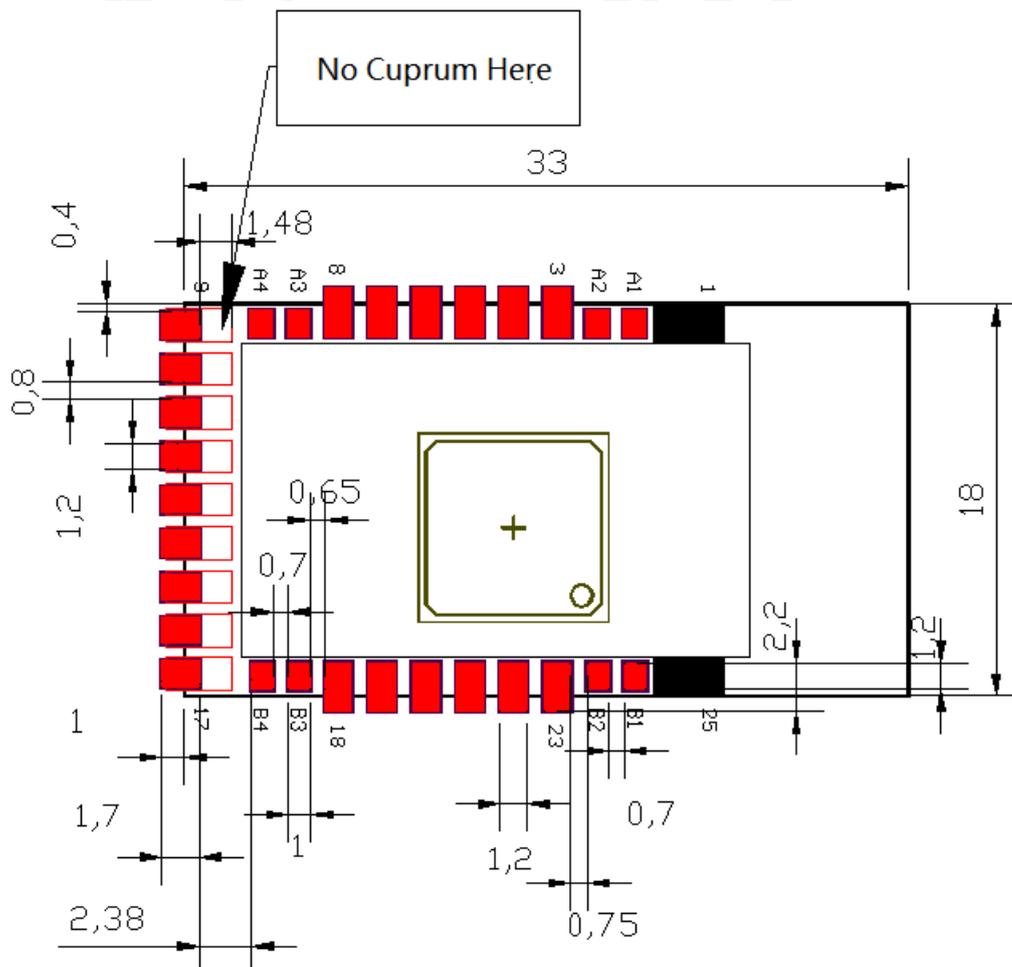
Figure 4 Package Dimension for Half-hole Footprint Fit

1.3 Pin Description

1.3.1 Pin Diagram
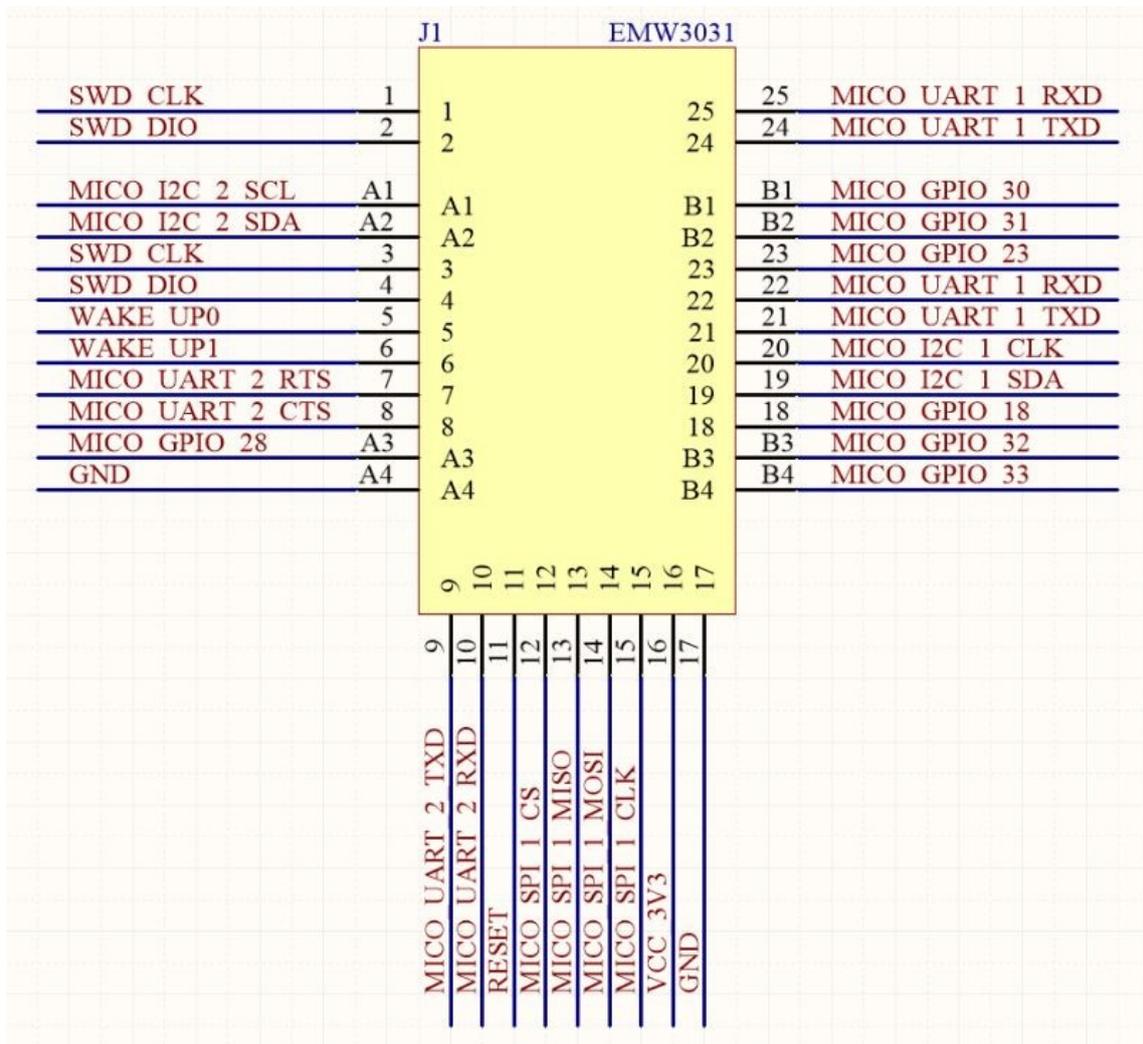
Figure 5 EMW3031 Pin Diagram

1.3.2 Pin Arrangement

Table 1 EMW3031pin arrangement

Pin No.	FUN1	FUN2	FUN3	FUN4	FUN5
1、3	SWD_CLK	MICO_GPIO_1			
2、4	SWD_DIO	MICO_GPIO_2			
5	WAKE_UP0	MICO_GPIO_5			
6	WAKE_UP1	MICO_GPIO_6			
7	MICO_UART_2_RTS	MICO_GPIO_7	MICO_SPI_2_CS	MICO_ADC_6	MICO_I2S_2_LRCK

Pin No.	FUN1	FUN2	FUN3	FUN4	FUN5
8	MICO_UART_2_CTS	MICO_GPIO_8	MICO_SPI_2_CLK	MICO_ADC_5	MICO_I2S_2_BCLK
9	MICO_UART_2_TXD	MICO_GPIO_9	MICO_SPI_2_TXD	MICO_ADC_7	MICO_I2S_2_D0UT
10	MICO_UART_2_RXD	MICO_GPIO_10	MICO_SPI_2_RXD	MICO_ADC_8	MICO_I2S_2_DIN
11	RESET				
12	MICO_SPI_1_CS	MICO_GPIO_12	MICO_PWM_2	MICO_UART_3_RTS	MICO_I2S_1_LRCK
13	MICO_SPI_1_MISO	MICO_GPIO_13	MICO_PWM_4	MICO_UART_3_RXD	MICO_I2S_1_DIN
14	MICO_SPI_1_MOSI	MICO_GPIO_14	MICO_PWM_3	MICO_UART_3_TXD	MICO_I2S_1_D0UT
15	MICO_SPI_1_CLK	MICO_GPIO_15	MICO_PWM_1	MICO_UART_3_CTS	MICO_I2S_1_BCLK
16	VCC_3V3				
17	GND				
18	MICO_GPIO_18				
19	MICO_I2C_1_SDA	MICO_GPIO_19	MICO_PWM_5		AUDIO_CLK
20	MICO_I2C_1_CLK	MICO_GPIO_20	MICO_PWM_6		
21、24	MICO_UART_1_TXD	MICO_GPIO_21		MICO_ADC_3	MICO_DAC_1
22、25	MICO_UART_1_RXD	MICO_GPIO_22		MICO_ADC_4	EXT_VREF
23	MICO_GPIO_23				
A1	MICO_I2C_2_SCL	MICO_GPIO_27		MICO_UART_2_RXD	
A2	MICO_I2C_2_SDA	MICO_GPIO_26		MICO_UART_2_TXD	
A3	MICO_GPIO_28			32K_OUT	
A4	GND				
B1	MICO_GPIO_30			MICO_ADC_2	MICO_DAC_2
B2	MICO_GPIO_31			MICO_ADC_1	
B3	MICO_GPIO_32				
B4	MICO_GPIO_33				

2. Electrical Parameters

2.1 Operating Ratings

EMW3031 enters an unstable condition whenever the input voltage dips below the minimum value of supply voltage. This condition must be considered during design of the power supply routing, especially if operating from a battery.

Table 2 Voltage Conditions

Symbol	Description	Conditions	Specification			
			Min.	Typical	Max.	Unit
VDD	Voltage		2.66	3.3	3.6	V

Stresses above the absolute maximum ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Absolute maximum ratings:

Table 3 Current Conditions

Symbol	Note	Min	Max	Unit
VDD	Power supply	−0.3	3.6	V
VIN	Input voltage on other pins	−0.3	3.6	V

2.2 Power consumption

Table 4 EMW3031 power consumption

Status	Average current (3V3)	Peak current (3V3)	Description
Power on	63.15mA	68.80mA	Power on, No data transmission
Set up softAP	65.28mA	294.00mA	Set up softAP, No data transmission
Set up softAP, Create Connection	65.50mA	295.10mA	EMW3031 sets up softAP, create one connection to the AP
Set up station	65.52mA	159.80mA	Set up station.
Wi_Fi power save on	25.82mA	153.2mA	Turn on Wi_Fi power save
Wi_Fi power save off	63.34mA	76.00mA	Turn off Wi_Fi power save

Status	Average current (3V3)	Peak current (3V3)	Description
standby	41.58uA	0.4mA	standby

Note:

600mA DCDC current is recommended as the power supply.

2.3 Temperature & Humidity

Table 5 Operating temperature and humidity

Symbol	Item	Scale	Unit
TSTG	Storage temperature	-40 to +85	℃
TA	Working temperature	-30 to +85	℃
Humidity	Non condensing, relative humidity	95%	-

2.4 ESD

Absolute maximum ratings: The Electromagnetic Environment Electrostatic discharge.

Table 6 ESD parameters

Symbol	Ratings	Conditions	Class	Max	Unit
V_{ESD}(HBM)	Electrostatic discharge voltage (human body model)	TA= +25 °C conforming to JESD22-A114	2	2000	V
V_{ESD}(CDM)	Electrostatic discharge voltage (charge device model)	TA = +25 °C conforming to JESD22-C101	II	500	

These tests are compliant with EIA/JESD 78A IC latch-up standard.

3. RF characteristics

3.1 Basic RF characteristics

Table 7 RF basic attributes

Item		Specification
Operating Frequency		2.412~2.484GHz
Wi-Fi Standard		802.11b/g/n(single stream n)
Modulation Type		11b: DBPSK, DQPSK,CCK for DSSS 11g: BPSK, QPSK, 16QAM, 64QAM for OFDM 11n: MCS0~7,OFDM＊
Data Rates	20MHz	11b:1, 2, 5.5 and 11Mbps 11g:6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~7, up to 72Mbps
Antenna type		PCB printed ANT U.F.L connector for external antenna (Optional)

3.2 TX characteristics

3.2.1 IEEE802.11b Mode

Table 8 TX characteristics in IEEE802.11g mode

Channel	Transmitter Output Power (dBm)	EVM (dBm)	Frequency Offset (ppm)
1	17.4	-35.5	-0.28
2	17.4	-35.7	-0.18
3	17.3	-35	-0.48
4	17.3	-34.6	-1.08
5	17.4	-35.7	-0.58
6	17.2	-35.3	-1.08
7	17.0	-34.4	-0.48
8	17.0	-34.4	-0.68
9	16.6	-35	-0.98
10	16.8	-34.7	-0.28
11	16.6	-35.2	-0.88
12	16.7	-34.6	-0.48

Channel	Transmitter Output Power (dBm)	EVM (dBm)	Frequency Offset (ppm)
13	16.7	-34.7	-0.28

3.2.2 IEEE802.11n-HT Mode

Table 9 TX characteristics in IEEE802.11g mode

Channel	Transmitter Output Power (dBm)	EVM (dBm)	Frequency Offset (ppm)
1	17.4	-35.5	-0.28
2	17.4	-35.7	-0.18
3	17.3	-35	-0.48
4	17.3	-34.6	-1.08
5	17.4	-35.7	-0.58
6	17.2	-35.3	-1.08
7	17.0	-34.4	-0.48
8	17.0	-34.4	-0.68
9	16.6	-35	-0.98
10	16.8	-34.7	-0.28
11	16.6	-35.2	-0.88
12	16.7	-34.6	-0.48
13	16.7	-34.7	-0.28

3.2.3 IEEE802.11n-HT Mode

Table 10 TX characteristics in IEEE802.11n-HT mode

Channel	Transmitter Output Power (dBm)	EVM (dBm)	Frequency Offset (ppm)
1	15.9	-35.2	-0.98
2	15.9	-35.4	-0.68
3	16.1	-35.8	-0.88
4	15.9	-36	-1.18
5	16.2	-36	-0.88
6	15.9	-35.5	-0.58
7	15.6	-35.4	-0.68
8	15.5	-35.6	-0.48
9	15.7	-36.2	-0.78
10	15.7	-36.1	-0.48

Channel	Transmitter Output Power (dBm)	EVM (dBm)	Frequency Offset (ppm)
11	15.5	-36	-0.28
12	15.5	-35.8	-0.68
13	15.6	-35.9	-0.68

3.3 RX Characteristics

3.3.1 IEEE802.11b Mode

Table 11 RX characteristics in IEEE802.11b mode with bandwidth 20MHz

Channel \ Rate	1M(dBm)	11M(dBm)
	IEEE spec ： -83	IEEE spec ： -76
1	-98	-88
2	-98	-88
3	-98	-88
4	-97	-87
5	-97	-87
6	-97	-87
7	-97	-87
8	-97	-87
9	-97	-87
10	-97	-87
11	-97	-87
12	-97	-87
13	-97	-87

3.3.2 IEEE802.11g mode

Table 12 RX characteristics in IEEE802.11g mode with bandwidth 20MHz

channel \ rate	6M(dBm)	54M(dBm)
	IEEE spec ： -82	IEEE spec ： -65
1	-90	-72
2	-90	-73
3	-90	-73

rate channel	6M(dBm)	54M(dBm)
4	-90	-73
5	-89	-72
6	-90	-73
7	-90	-73
8	-89	-73
9	-90	-73
10	-89	-73
11	-89	-72
12	-89	-73
13	-89	-73

3.3.3 IEEE802.11n-HT mode

Table 13 RX characteristics in IEEE802.11n-HT mode with bandwidth 20MHz:

Rate Channel	MCS0(dBm)	MCS7(dBm)
	IEEE spec ： -82	IEEE spec ： -64
1	-89	-70
2	-89	-70
3	-89	-69
4	-89	-69
5	-89	-69
6	-89	-69
7	-88	-69
8	-89	-69
9	-88	-69
10	-88	-69
11	-88	-70
12	-88	-69
13	-89	-70

4. Antenna information

4.1 Type of antenna

There are two types of antenna，including PCB antenna and external antenna. The default type is PCB antenna.

Type of Antenna:

Figure 6 EWM3031-P

Figure 7 EMW3031-E

4.2 Minimizing radio interference

When integrating the Wi-Fi module with on board PCB printed antenna, make sure the area around the antenna end the module protrudes at least 15mm from the mother board PCB and any metal enclosure. If this is not possible use the on board U.FL connector to route to an external antenna. The area under the antenna end of the module should be keep clear of metallic components, connectors, vias, traces and other materials that can interfere with the radio signal.

Minimum size of keep-out zone around antenna：
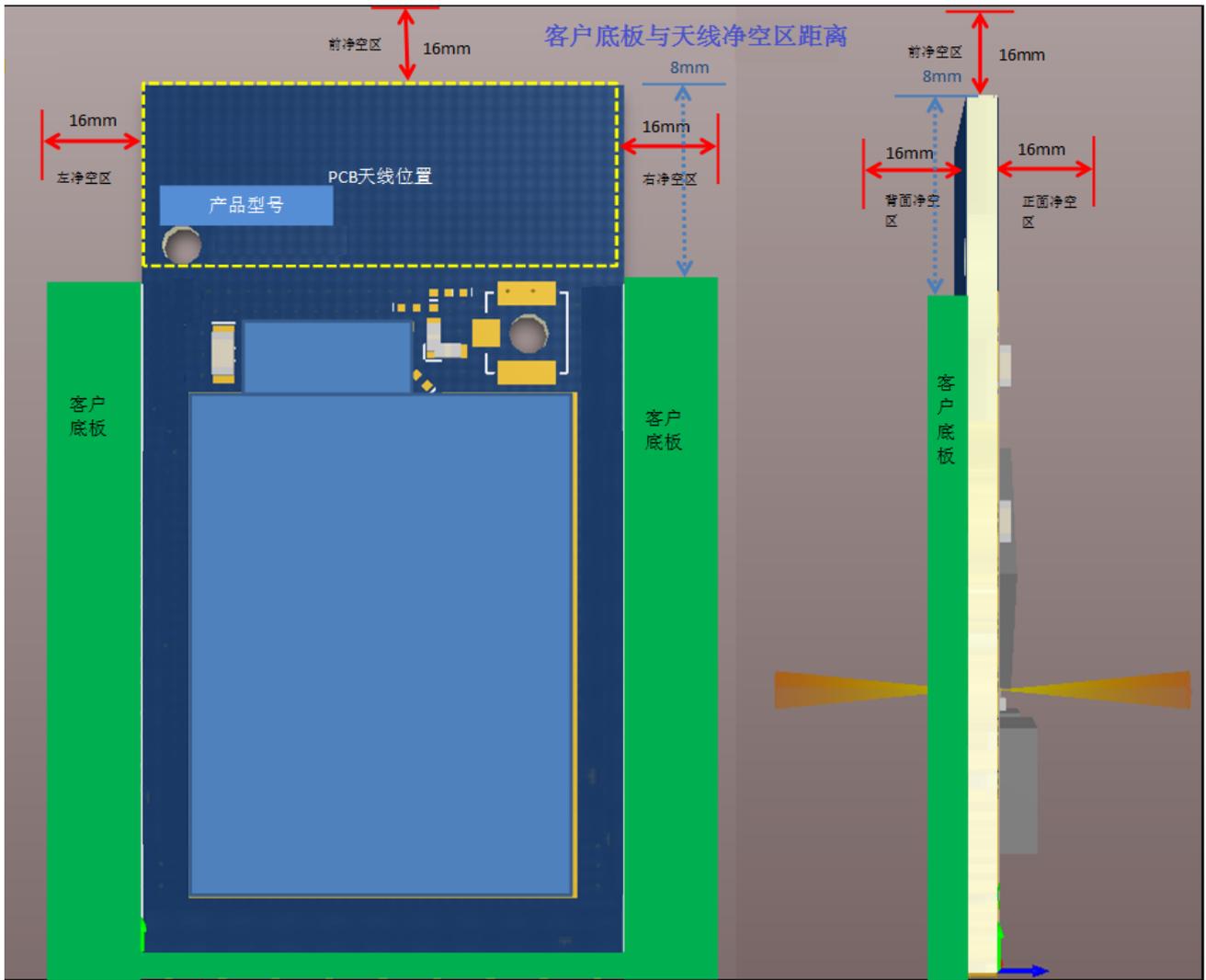
Figure 8 Antenna minimum clearance zone

4.3   U.F.L RF Connector

This module use U.F.L type RF connector for external antenna connection.
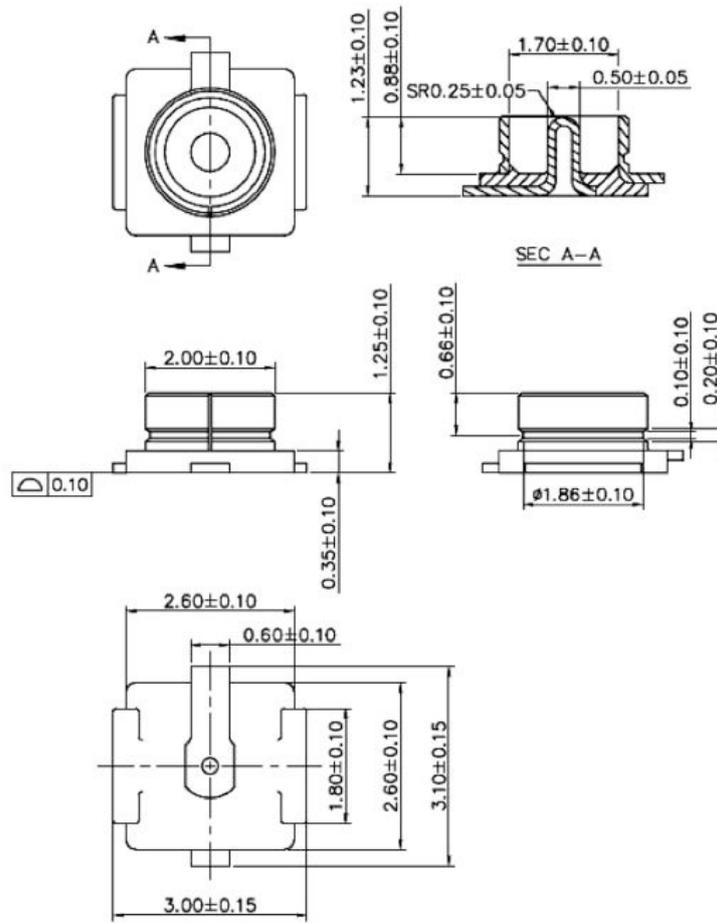
Figure 9 An external antenna connector size diagram

5. Mechanical Dimensions

5.1 Mechanical Dimensions

EMW3031top view (Unit: mm):
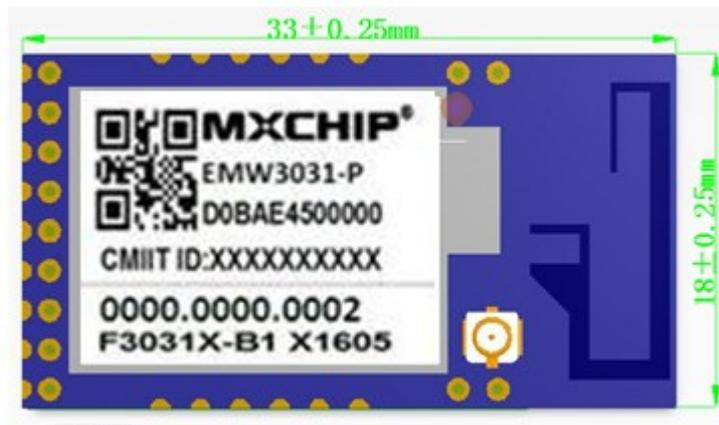
Figure 10 EMW3031 Top View

EMW3031 side view (Unit: mm):
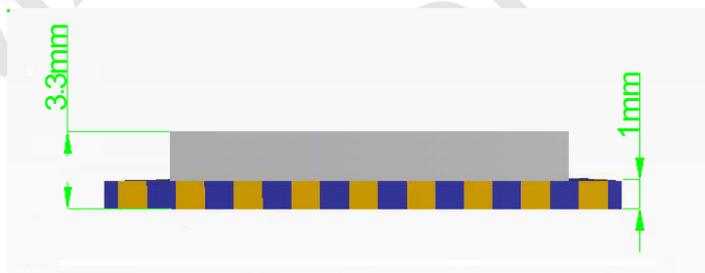
Figure 11 EMW3031 Side View(Right Side)
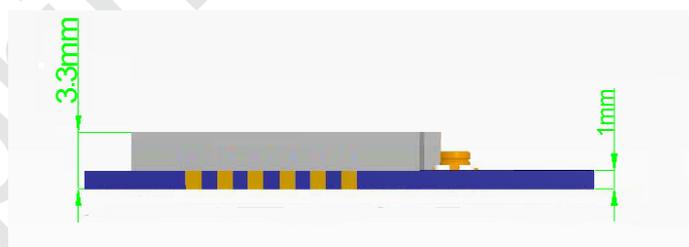
Figure 12 EMW3031 Side View (Left Side)

5.2 Use guidelines (Please read carefully)

- Stamps port Wi-Fi modules which factory from MXCHIP are   welding must by SMT machine.

    1. SMT need machine:
        - Reflow soldering SMT machine
        - The AOI detector
        - 6-8 mm diameter suction nozzle

2. baking need equipment:
  · Cabinet baking box
  · The antistatic, high temperature resistant tray
  · The antistatic high temperature resistant gloves
● Storage conditions as follows
  · Moisture bag must be stored in a temperature < 30 ° C, humidity 85% RH of the　　 environment.
  · Dry packaging products, the guarantee period should be from 6 months from the date of packing seal.
  · Sealed packaging is equipped with humidity indicator card, as shown in Figure 13.
● Humidity indicator CARDS and baking several ways as follows:

Figure 13 Temperature and humidity indicator CARDS

● When opened, if the temperature and humidity indicator CARDS read 10%, 20%, 30%,40% three color ring are blue, to continue to bake for 2 hours for module;
● When opened, if the humidity indicator CARDS read 10% color ring into pink, need to continue to bake module 4 hours;
● When opened, if the humidity indicator CARDS read into 10%, 20%, color ring into pink, need to continue to bake for 6 hours module;
● When opened, if the humidity indicator CARDS read into 10%, 20%, 30% are pink color ring, need to continue to bake for 12 hours module;
● When opened, if the humidity indicator CARDS read into 10%, 20%, 30% ,40%are pink color ring, need to continue to bake for 14 hours module;
● Baking parameters are as follows:
  · Baking temperature: 125 ℃ + / - 5 ℃;
  · Set the alarm temperature as 130 ℃;
  · Under the condition of natural cooling＜36 ℃, SMT placement can be made;
  · Dry times: 1 times;
● If opened the time more than 3 months, please ban the use of SMT process welding this batch module, zedoary because PCB process, more than 3 months bonding pad oxidation, SMT is likely to cause virtual welding, welding, the resulting problems we do not assume corresponding responsibility.
● Please to ESD（static discharge，static electricity discharge） protection module before SMT;

● Please according to the SMT reflow soldering curve, peak temperature 245 ℃, reflow soldering,temperature curve as shown in figure 14, section 7.6;
● For the first time in order to ensure the qualified rate of reflow soldering, first SMT please extraction 10% product to visual analysis, AOI inspection, to ensure that the furnace temperature control, device adsorption

method, the rationality of the put way; Suggestions：when batch production per hour 5-10 pieces of visual analysis, AOI test;

5.3   The matters needing attention

● In the entire production, Each station of the operator must wear anti-static gloves;

● When baking, no more than baking time;

● When roasting, it is forbidden to join explosive, flammable, corrosive substances;

● When baking, high temperature module application tray in the oven, keep the air circulation between each module, at the same time avoid direct contact with the oven wall module;

● Baking, please will bake the door is closed, the guarantee baking box sealing, prevent leakage, temperature influence the baking effect;

● Don't open the door, as far as possible when baking box running if must open, shortening the time of can open the door as far as possible;

● After baking, must be natural cooling modules to < 36 ℃ before wear anti-static gloves out, so as not to burn.

● Operation, forbidden module bottom touch water or dirt;

● Temperature and humidity control level for Level3, storage and baking conditions based on IPC/JEDEC J - STD - 020.

5.4 MSL/Storage Condition

Figure 14 torage Condition

5.5 Recommended Reflow Profile

Solder paste recommendations: SAC305, Lead -Free solder paste.

Reflow times<= 2times (Max.)

- 1.Max Rising Slope : 3℃/sec
- 2.Max Falling Slope: -3 ℃/sec
- 3.Soaking Time(150℃~180℃): 60sec~120sec
- 4.Over 217℃ Time:60sec~120sec；
- 5.Peak Temp.240℃~250℃

Recommended reflow profile:
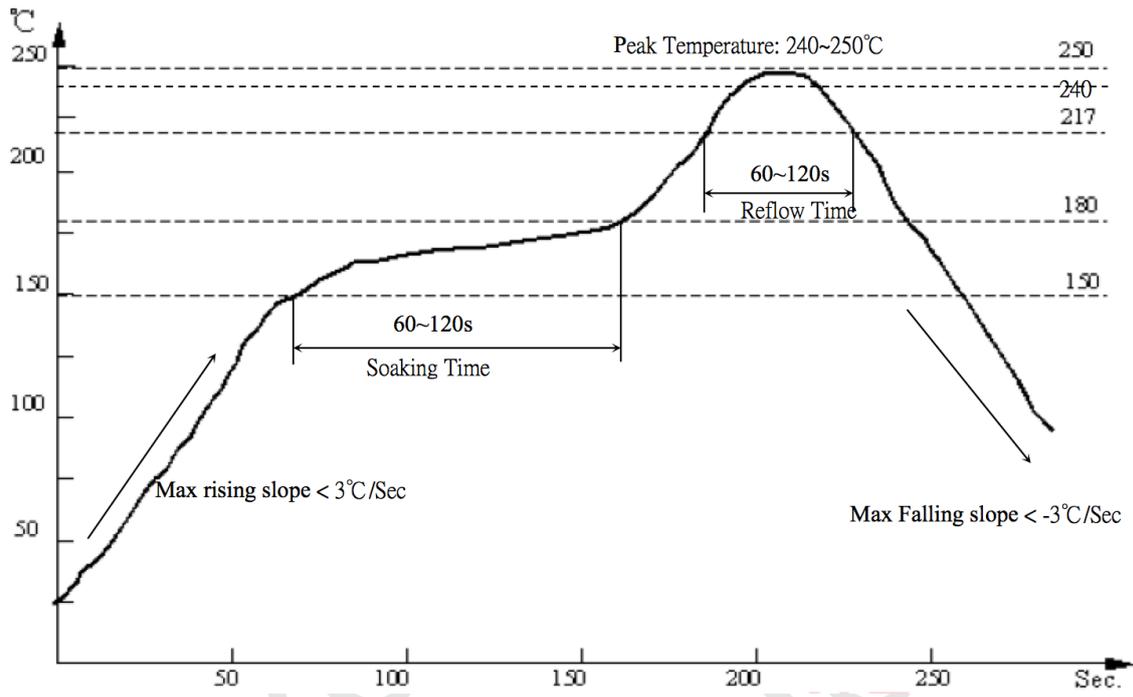
Figure 15 Temperature Curve

6. Reference circuit

The recommended power supply circuit for EMW3031:
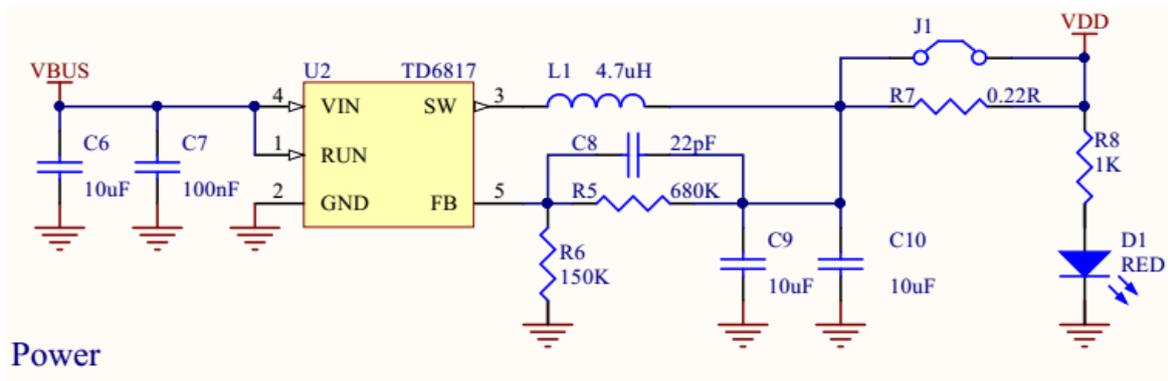
Figure 16 Power reference circuit

The recommended USB to Serial circuit for EMW3031:
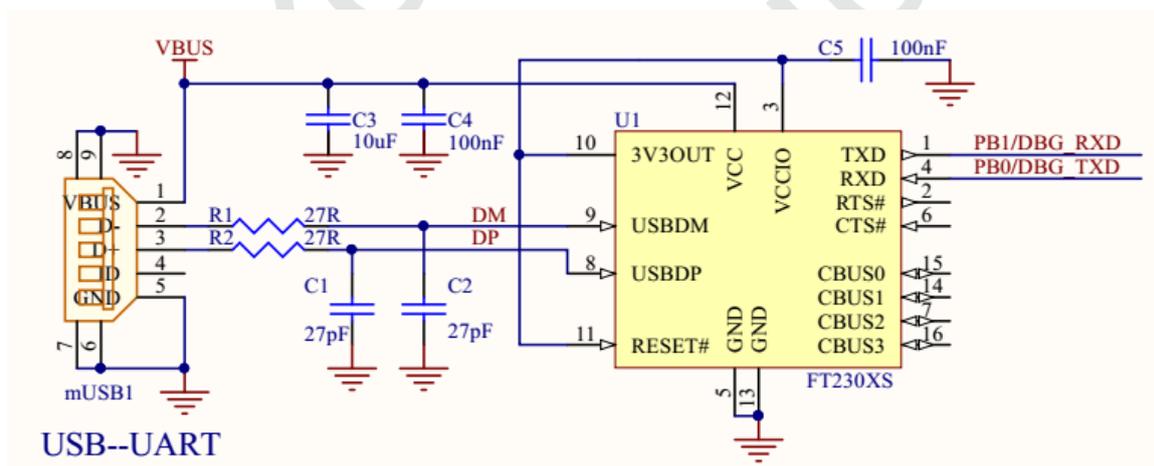
Figure 17 USB to serial reference circuit

The recommended external circuit design for EMW3031:
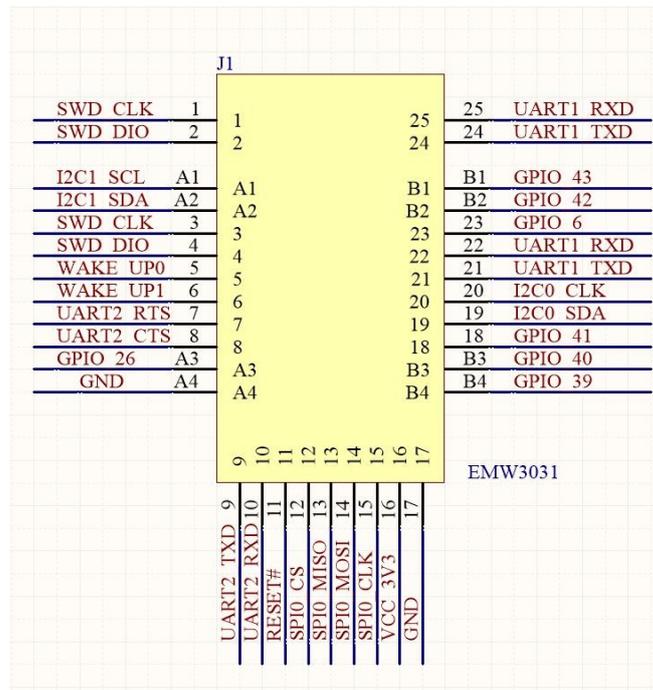
Figure 18 External Circuit Design

The recommended 5V UART – 3.3V UART Circuit:
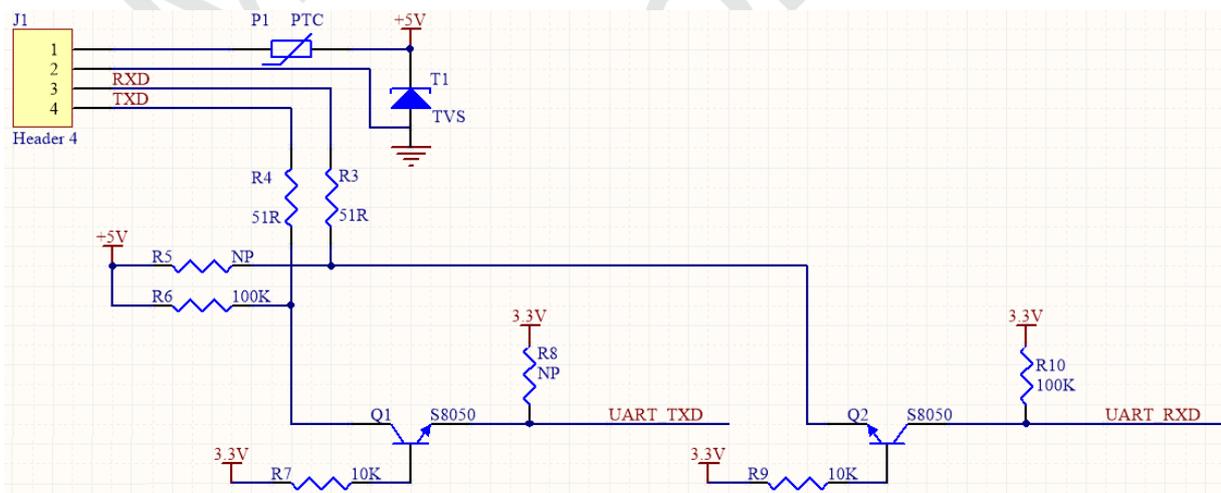
Figure 19 UART 5 V - 3.3 V conversion circuit

7. Sales Information and Technical Support

If you need to get the latest information on this product or our other product information, you can visit: http://www.mxchip.com/.

If you need to get technical support, please call us during the working hours.

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

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