EMW3090

Datasheet

Embedded Wi-Fi module

Vision：1.0   Date：2017-06-12   Number: DS0084EN

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.

- 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
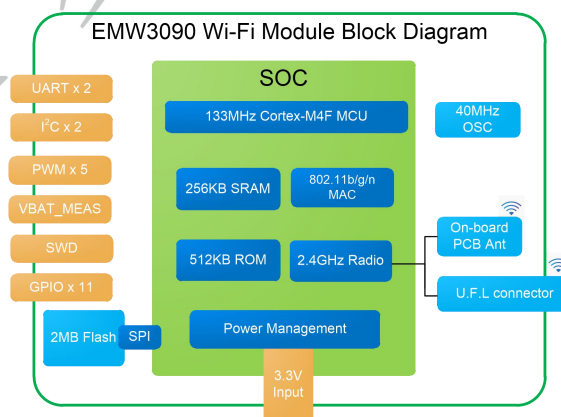
    - Up to 13GPIOs

- Operating Temperature：-20℃ to +85℃

Application

- Intelligent lighting

- Intelligent Transportation

- Smart Home Application

- industrial automation

- Intelligent Security

Module Type

Type	Illustration
EMW3090-P	PCB antenna
EMW3090-E	IPEX connector

Hardware Block

EMW3090 Wi-Fi Module Block Diagram

Version Illustration

Date	Vision	Details
2017-06-12	1.0	Initial document

Content

Figure Content

Product Introduction

EMW3090 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 SMT or DIP(Dual In-line Package). Peripherals: 2xUART / 1x SPI /2x I2C / 6x PWM / Up to 13 GPIOs.

EMW3090 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.

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
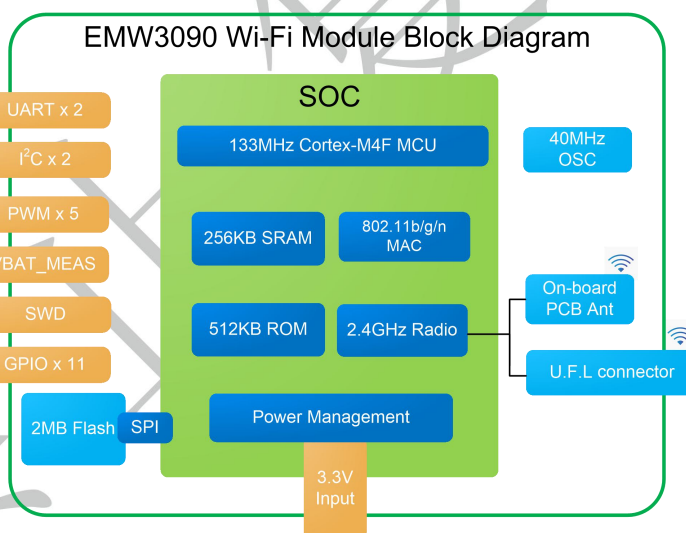
EMW3090 Hardware block

1.1 EMW3090 Label Information

Figure 1 EMW3090 Label Information

Label Information：

CMIIT ID:XXXXXXXX : SRRC approval number

EMW3090: Module type

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

X1701：production batch

XXXX.XXXX.XXXX : SN series number

1.2 Pin Arrangement

EMW3090 has half-hole SMT package.

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.
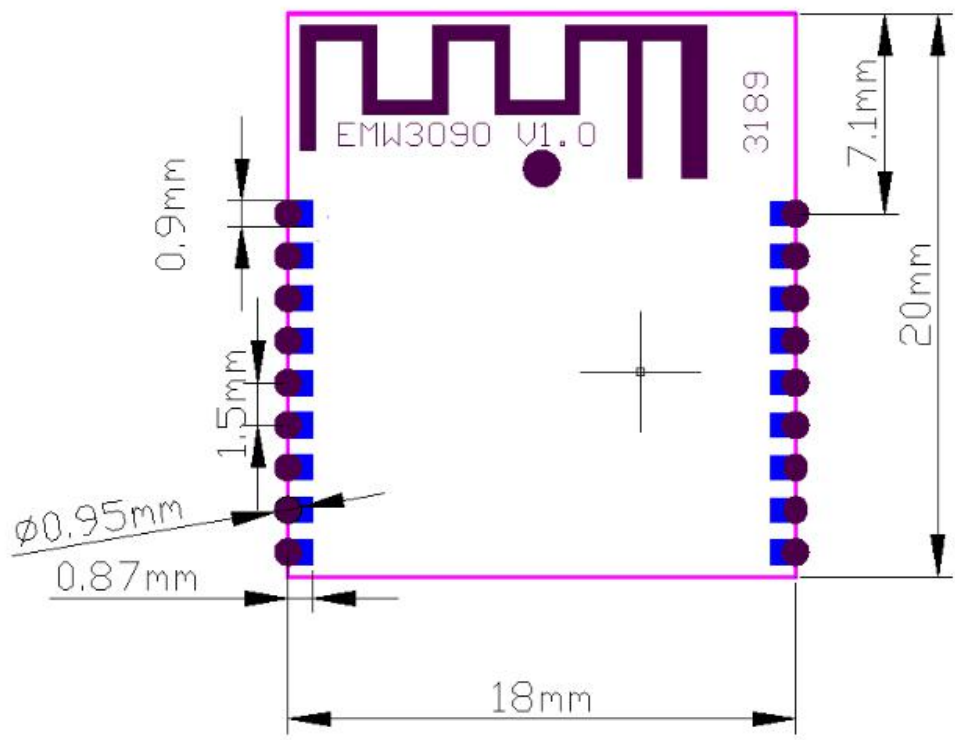
Figure 2   Half-hole SMT Package Size

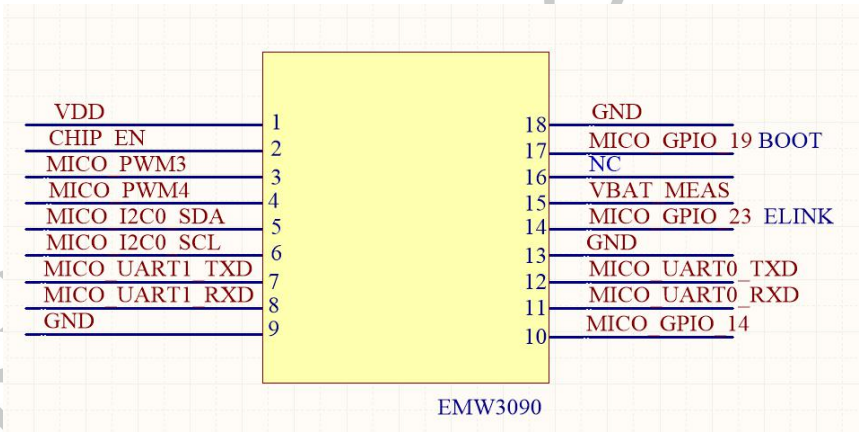## 1.3 Pin Definition

1.3.1   EMW3090 Package Definition

Figure 3 EMW3090 Package Definition

1.3.2 EMW3090 Pin Definition

Table 1 EMW3090 Pin Definition

Pin NO.	FUNCTION1	FUNCTION2	FUNCTION3	FUNCTION4	FUNCTION5
1	VDD				
2	CHIP_EN				
3	MICO_GPIO_12			MICO_PWM3	
4	MICO_GPIO_13			MICO_PWM4	
5	MICO_GPIO_8	MICO_I2C0_SDA	MICO_UART0_CTS		MICO_SPI1_CS
6	MICO_GPIO_7	MICO_I2C0_SCL	MICO_UART0_RTS	MICO_PWM6	MICO_SPI1_MISO
7	MICO_GPIO_21	MICO_I2C0_SDA	MICO_UART1_TXD	MICO_PWM4	
8	MICO_GPIO_22	MICO_I2C0_SCL	MICO_UART1_RXD	MICO_PWM5	
9	GND				
10	MICO_GPIO_14			MICO_PWM5	
11	MICO_GPIO_10	MICO_I2C1_CLK	MICO_UART0_RXD		MICO_SPI1_CLK
12	MICO_GPIO_9	MICO_I2C1_SDA	MICO_UART0_TXD	MICO_PWM1	MICO_SPI1_MOSI
13	GND				
14	MICO_GPIO_23				
15	VBAT_MEAS				
16	NC				
17	MICO_GPIO_19				
18	GND				

Notes：

(1) PIN 17 is used as BOOT，PIN14 is used as EASYLINK, please do not use pin 7 and 8 in hardware design. Please contact engineer of MXCHIP if it is necessary to use the two pins.

(2) PIN7/8 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.

2. Electrical Parameters

2.1 Operating Conditions

EMW3090 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 EMW3090 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		2.412~2.472GHz
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)

4. Antenna Information

4.1 Antenna Type

EMW3090 has two type of antenna: EMW3090-P and EMW3090-E

EWM3090-P   EMW3090-E
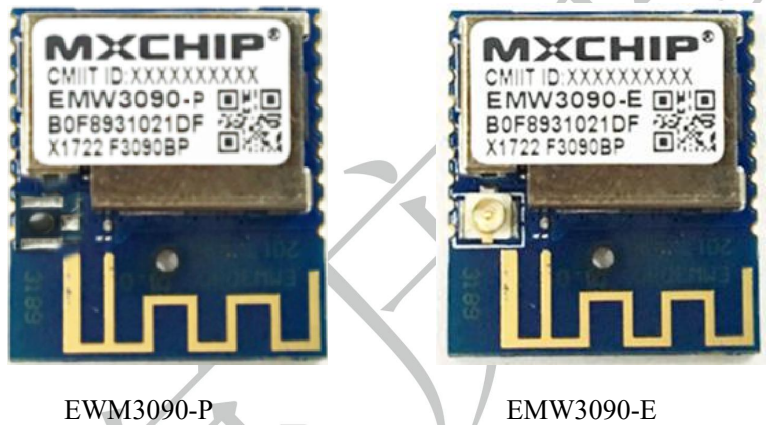
4.2 PCB Antenna Clearance Zone&PCB ANT parameter

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.
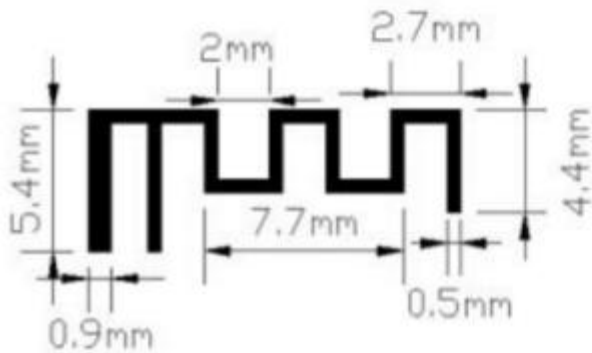
EMW3090-P PCB ANT

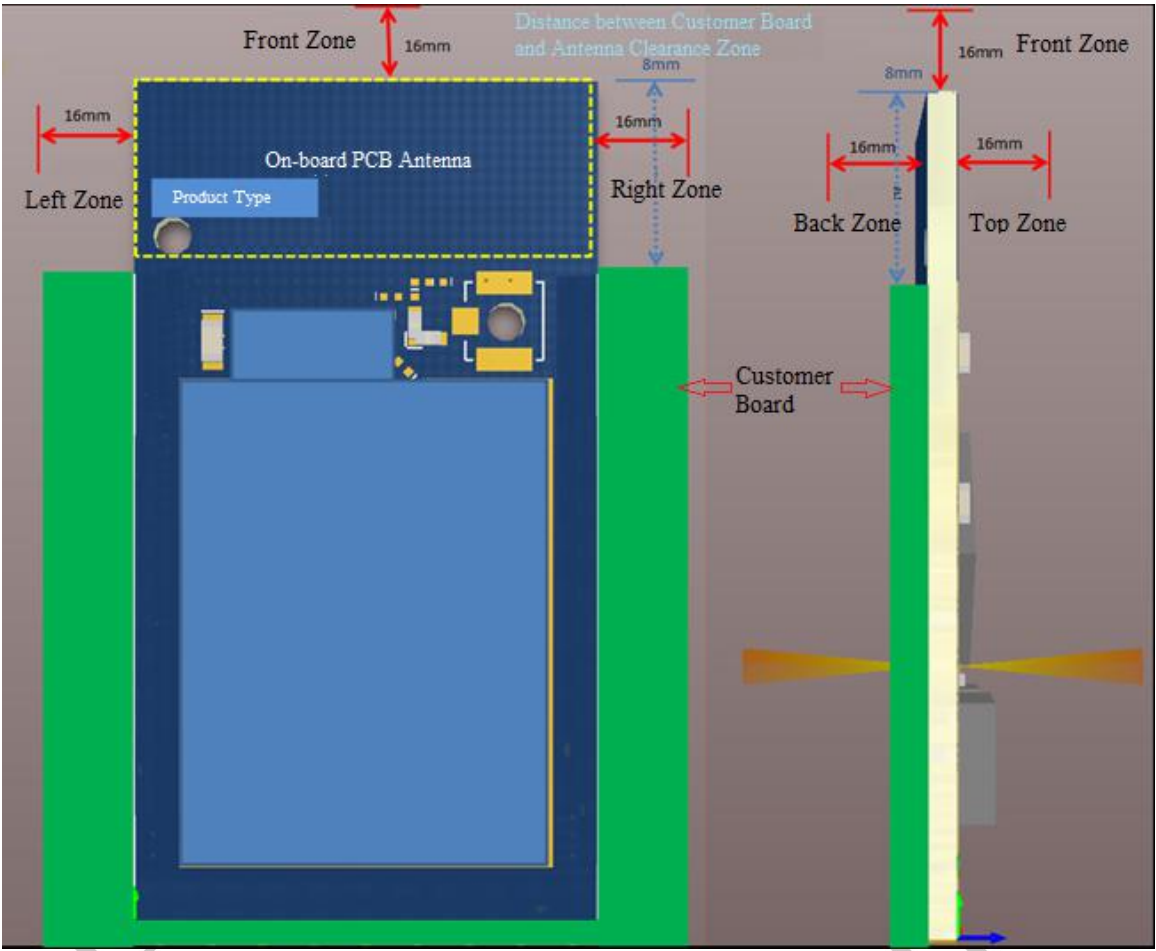| ANT MESSAGE	
Frequency	2.4GHz-2.5GHz
Impedance	50oHM
VSWR	1.3
Gain	2DBI
Polarization	Vertical
Radiation	Omnidirectional
STYLE	PCB Antenna

Figure 4 Minimum Clearance Zone of PCB Antenna (Unit: mm)

4.3 External Antenna Connector&External antenna parameters

1、External Antenna Parameter:
Model name：IPEX1.3-2.4G-L131

ANT MESSAGE	
Frequency	2.4GHz-2.5GHz
Impedance	50oHM
VSWR	1.3
Gain	2DBI
Polarization	Vertical
Radiation	Omnidirectional
STYLE	PIFA Antenna

Sunnyway Technology (China) Co. Ltd.
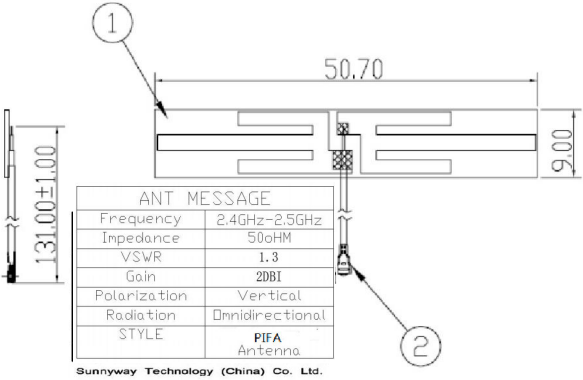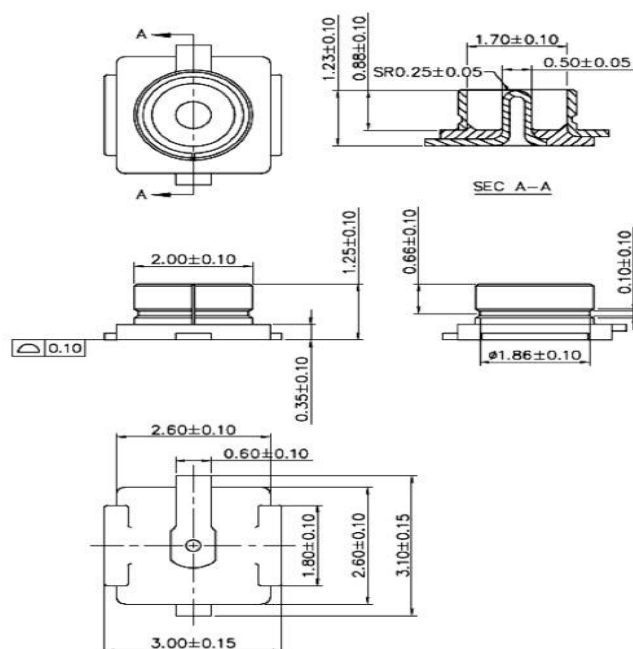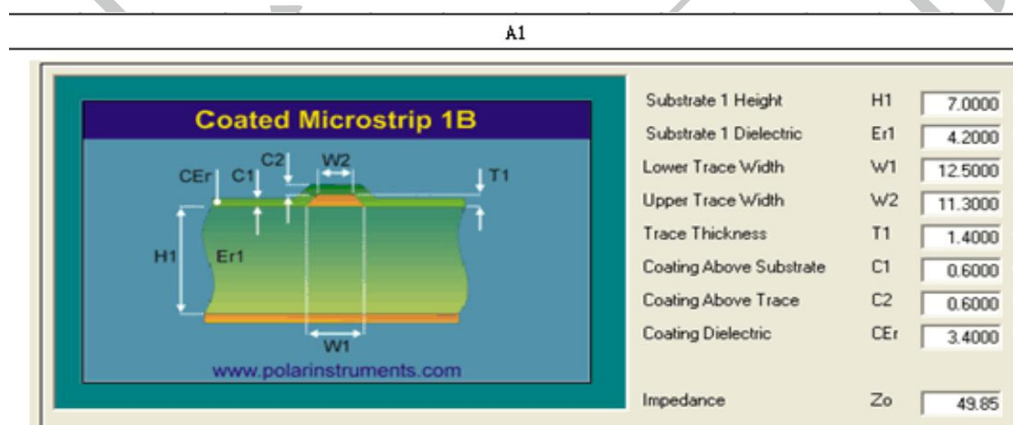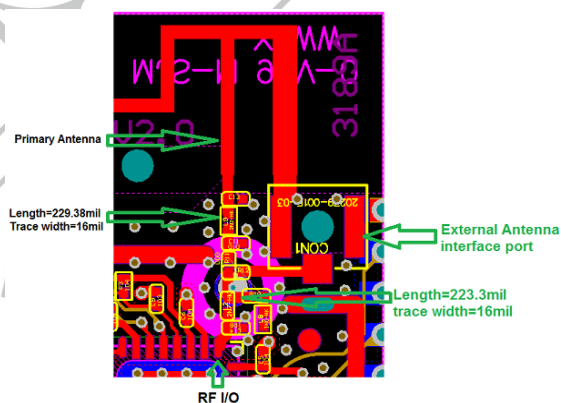
2、External Antenna Connector

Figure 5 Size of External Antenna Connector

3、antenna trace design

The characteristic impedance depends on the dielectric of PCB, the track width and the Ground plane spacing. Microstrip type is required. The detail simulation as below.

The RE trace of the test board which was used in the FCC test is defined as below.

5. 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 6 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.

5.1 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.

5.2 Storage Condition

CAUTION
This bag contains
MOISTURE-SENSITIVE DEVICES

LEVEL 3
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
   If Blank, see adjacent bar code label

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
      If Blank, see adjacent bar code label
      ≤ 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: _____
If Blank, see adjacent bar code label

Note: Level and body temperature defined by IPC/JEDEC J-STD-020

Figure 7 Storage Condition

5.3 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.
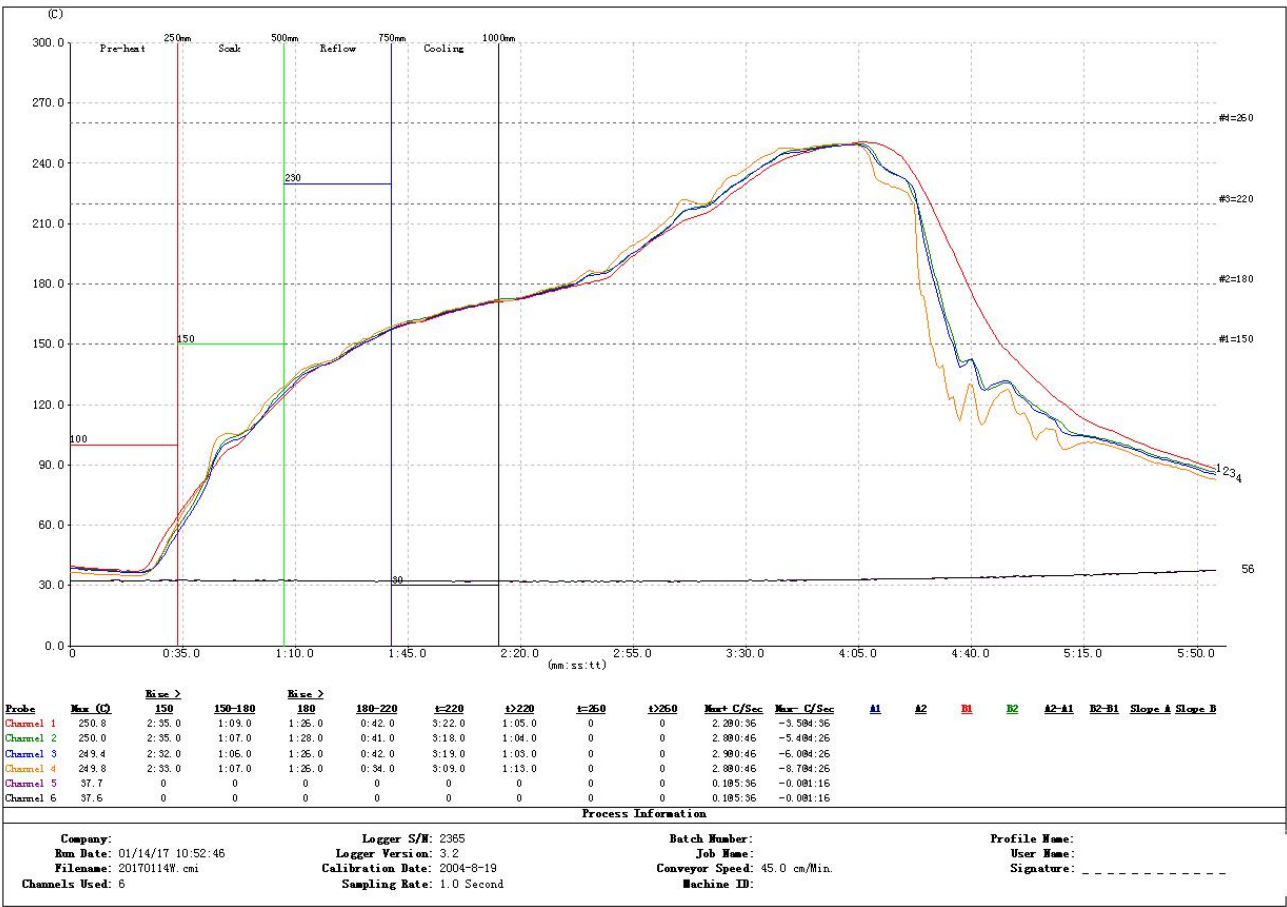

Figure 8 Temperature Curve of Secondary Reflow

6. Reference Circuit

Power source circuit is shown in figure 9, USB to UART is shown in figure 10, external interface circuit is shown in figure 11.
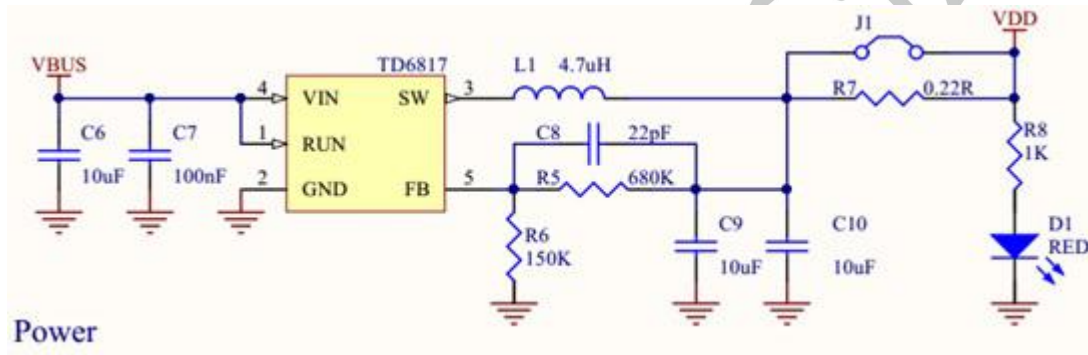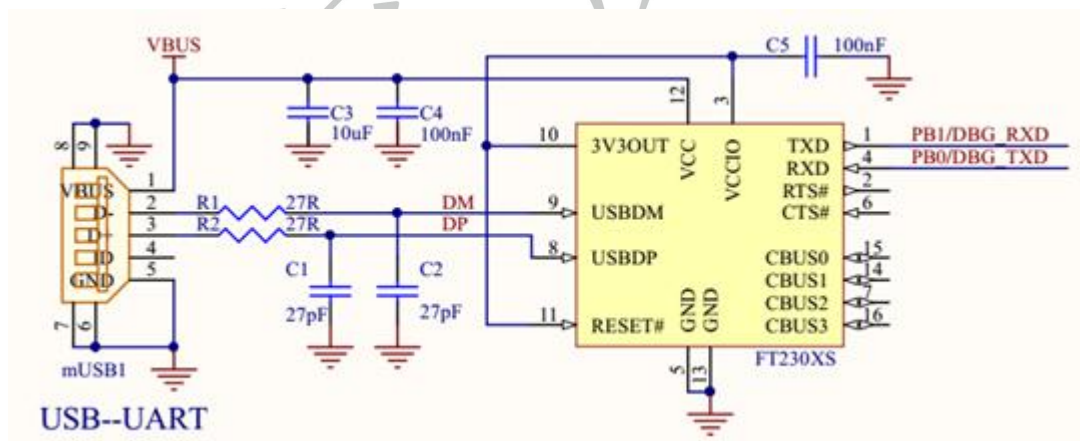

Figure 9 Power Source Circuit
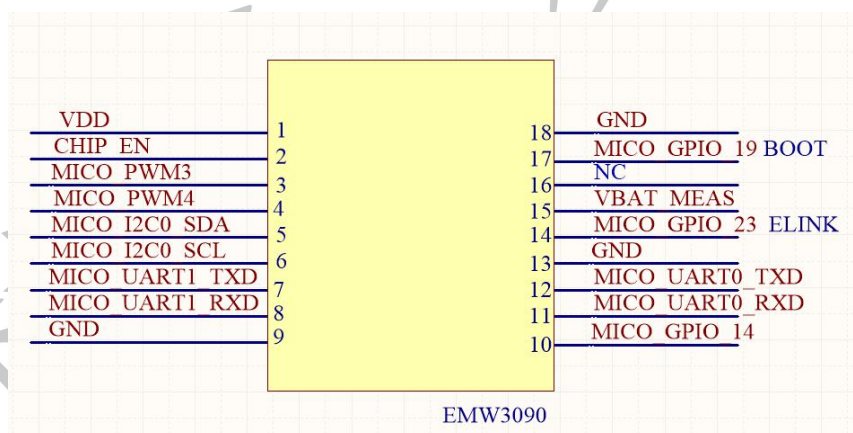

Figure 10 USB to UART

Figure 11 External Interface Circuit of EMW3090

Voltage of EMW3090 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.

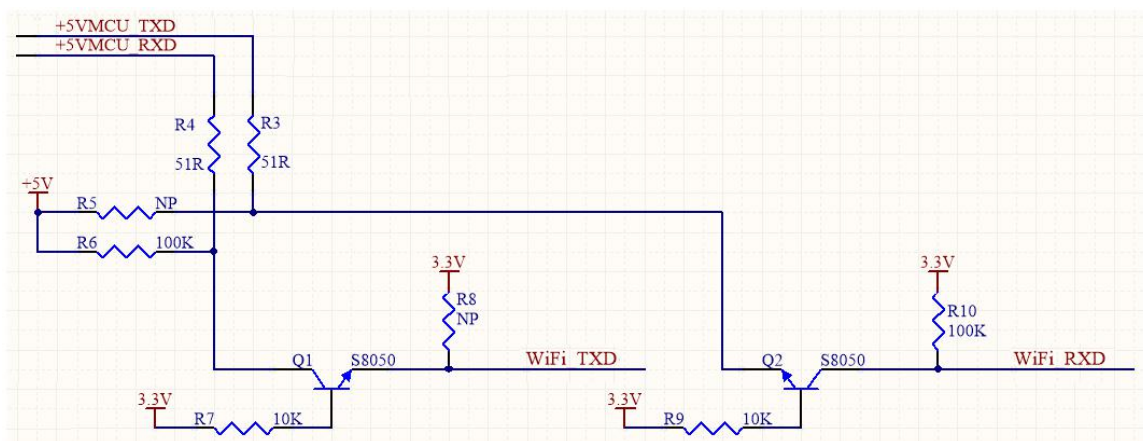Figure 12 3.3V UART- 5V UART Convert Circuit

7. 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: 9thFloor, No.5, Lane2145 JinshaJiang Road Putuo District, ShangHai.

Postcode：200333

Email: sales@mxchip.com

MXCHIP®

FCC Regulations:

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 device 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 radiated 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.

Caution: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure Information

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module. 20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains Transmitter Module FCC ID: P53-EMW3090 ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of 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.