Datasheet

EMW3060

Embedded Wi-Fi module

Version：1.8 **Date：2018-12-30** **Number: DS0089EN**

Abstract

Features

- Support 802.11b/g/n, integrate ARM9, 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 SDIO
  - 1x JTAG
  - Up to 15GPIOs
- Operating Temperature：-20℃ to +85℃

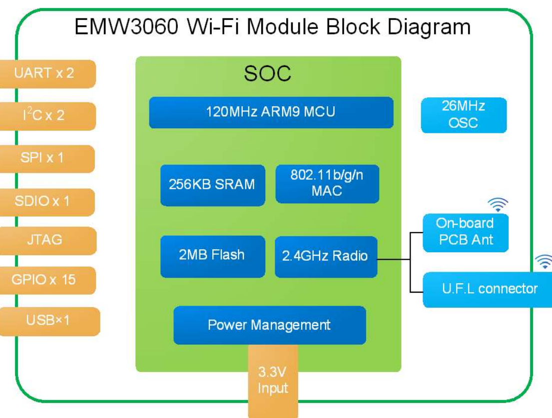
Application

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

Module Type

Part number	Antenna type	Note
EMW3060-P	PCB antenna	Default
EMW3060-E	IPEX antenna	Optional

Hardware Block



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Version History

Date	Vision	Details
2018-11-08	1.7	First English version
2018-11-30	1.8	Update label information Update module picture

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1. Product Introduction

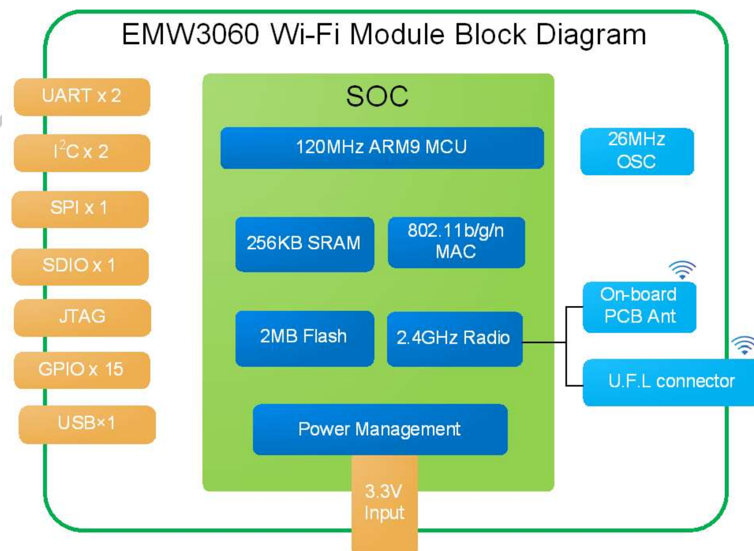
EMW3090 is a cost-effective embedded Wi-Fi module released by MXCHIP with high integrating ARM9, WLAN MAC/Baseband/RF. Maximum frequency 120MHz with 256KB SRAM and 2MB FLASH. Power supply is DC 3.3V. Mounting mode is LGA SMT or DIP(Dual In-line Package). Peripherals: 2xUART / 1x SPI /2x I2C / Up to 15 GPIOs.

Hardware diagram is shown below with four main parts:

- ARM9 main core
- WLAN MAC/BB/RF/ANT
- Peripherals
- Power management

With:

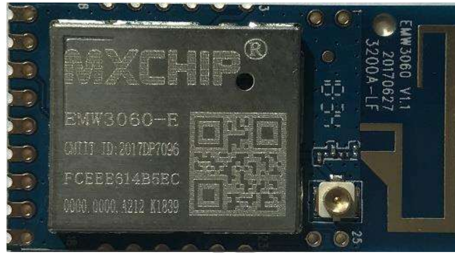
1. ARM9 CPU with 120MHz maximum frequency and 256KB SRAM and 2MB FLASH. Support high speed UART, I2C, SPI and multi-GPIO.
2. 2MB SPI Flash is used for custom firmware development
3. Support PCB antenna and IPEX
4. Input voltage: DC 3.3V



EMW3060 Hardware block

1.1 Label information

EMW3060-P



EMW3060-E

Label information：

EMW3060-P / EMW3060-E : Module model/ part number

CMIIT ID:2017DP7096: SRRC ID

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

0000.0000.A209 : serial number (firmware version number)

K1834：date code

1.2 Pin Arrangement

EMW3060 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.

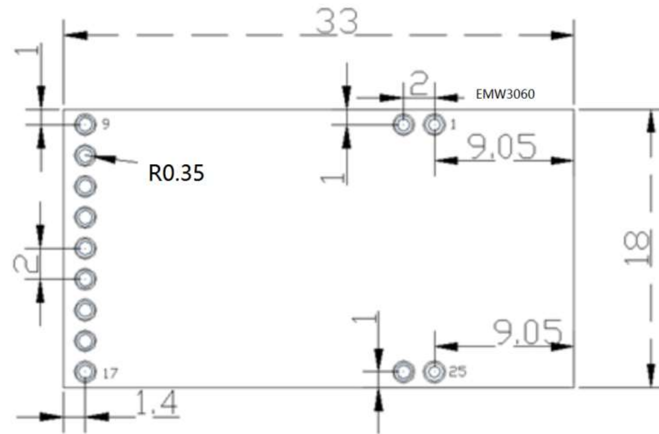


Figure 1 DIP Package Size

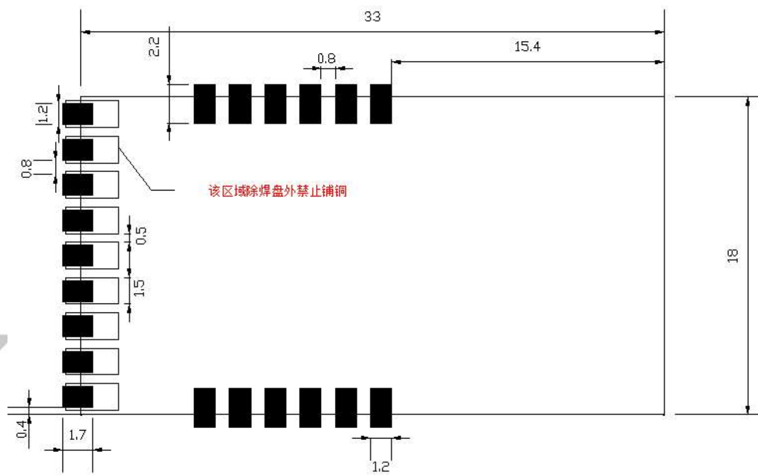


Figure 2 SOH Package Size

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1.3 Pin Definition

1.3.1 EMW3060 Package Definition

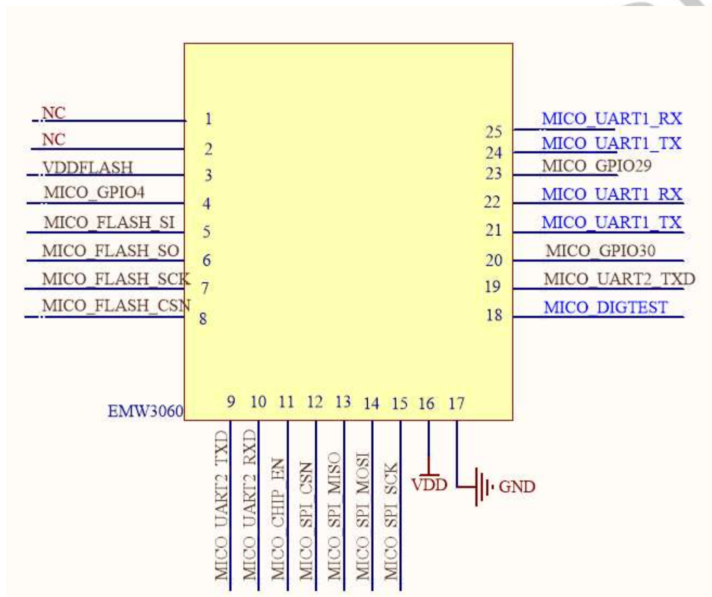

Figure 3 EMW3060 Package Definition

1.3.2 EMW3060 Pin Definition

Table 1 EMW3060 Pin Definition

NO.	FUNCTION1	FUNCTION2	FUNCTION3	FUNCTION4	FUNCTION5	FUNCTION6	NOTE
1	NC						
2	NC						
3	VDDFLASH						External 3.3V for programming Flash.
4		GPIO4				ADC1	
5	FLASH_SI	GPIO22			JTAG_TDI	XHOUT(high frequency clock output)	
6	FLASH_SO	GPIO23			JTAG_TDO	ADC3	
7	FLASH_SCK	GPIO20		I2C1_SCL	JTAG_TCK		
8	FLASH_CSN	GPIO21		I2C1_SDA	JTAG_TMS		
9	UART2_TXD	GPIO31		I2C2_SCL			

10	UART2_RXD	GPIO1		I2C2_SDA			
11	CHIP_EN						Reset, active low
12	SPI_CSN	GPIO15	SD_CMD				
13	SPI_MISO	GPIO17	SD_DATA1				
14	SPI_MOSI	GPIO16	SD_DATA0				
15	SPI_SCK	GPIO14	SD_CLK				
16	VDD						
17	GND						
18	DIGTEST						For firmware programming, active high
19	UART2_TXD						
20	USBDN	GPIO30					USB data N / GPIO30
21,	UART1_TX	GIOP11					
22,	UART1_RX	GPIO10					
23	USBDP	GPIO29					USB data P / GPIO29

Notes：

(1) Pin3, pin4, and pin 18 are used for firmware programming mode as default. Pin9 is boot pin. Pin20 is status pin. Pin21/24 and pin22/25 is for debug log output. Pin23 is Elink pin. Please don't use these pins for application usage. If you need to use these pins, please confirm with MXCHIP engineer.

(2)Pin19 should be high or floating when powered on.

(3) Keep CHIP_EN Not connected if not used.

(4)PIN5 can be used as high frequency clock output.

(5)PIN1/2/24/25 are through hole, not pad.

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2. Electrical Parameters

2.1 Operating Conditions

EMW3060 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 EMW3060 Power Consumption

Mode	Average current/mA	Max current/mA	Description
WIFI initialization	44.77	45.3	RF off, MCU run at max speed
WIFI connected	100.9	340.1	Keep WIFI connected with AP
UDP transmit	92.82	362.7	Connected with AP, and transmit UDP package at full speed
SoftAP	100.65	193.2	SoftAP mode
Easylink	100.58	129.1	WIFI configuration mode with easylink
Station	45.12	45.6	MCU runs at full speed, WIFI in station mode

Actual working current is variable at different operating mode. Maximum operating current is about 360 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

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

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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

Channel	Output power (dBm)	EVM(dB)	Frequency error (ppm)
1	17.3dBm	-23.7dB	-6.6ppm
2	17dBm	-23.5dB	-6.8ppm
3	17.6dBm	-23.7dB	-6.8ppm
4	17.7dBm	-23.6dB	-7.2ppm
5	17.5dBm	-23.5dB	-6.9ppm
6	17.4dBm	-23.4dB	-6.6ppm
7	17.3dBm	-23.4dB	-6.6ppm
8	17.2dBm	-23.3dB	-6.7ppm
9	17.6dBm	-23.3dB	-6.9ppm
10	17.6dBm	-23.3dB	-6.5ppm
11	17.5dBm	-23.2dB	-6.8ppm
12	17.4dBm	-23.2dB	-6.8ppm
13	17.8dBm	-23.1dB	-6.8ppm

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 error (ppm)
1	12.8dBm	-26.7dB	-6.8ppm
2	12.5dBm	-26.4dB	-6.8ppm
3	12.4dBm	-26.2dB	-6.8ppm
4	12.8dBm	-26dB	-6.8ppm
5	12.6dBm	-26.1dB	-7.2ppm
6	12.5dBm	-26.2dB	-6.8ppm
7	12.4dBm	-26dB	-6.9ppm
8	12.8dBm	-25.7dB	-6.9ppm
9	12.6dBm	-26.2dB	-6.8ppm
10	12.8dBm	-25.5dB	-6.9ppm
11	12.6dBm	-26dB	-6.6ppm
12	12.5dBm	-26.1dB	-6.8ppm
13	12.3dBm	-26.4dB	-6.8ppm

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 error (ppm)
1	11.4dBm	-28.1dB	-6.3ppm
2	11.3dBm	-28.6dB	-6.9ppm
3	11.1dBm	-28dB	-6.3ppm
4	11.7dBm	-27.6dB	-7.2ppm
5	11.6dBm	-27.6dB	-7.3ppm
6	11.5dBm	-27.5dB	-6.6ppm
7	11.4dBm	-27.6dB	-6.9ppm
8	11.3dBm	-27.7dB	-6.9ppm
9	11.2dBm	-27.8dB	-6.4ppm
10	11.6dBm	-27.2dB	-6.9ppm
11	11.5dBm	-27.4dB	-7ppm
12	11.4dBm	-27.8dB	-7.3ppm

Channel	Output power (dBm)	EVM(dB)	Frequency error (ppm)
13	11.7dBm	-27.8dB	-6.9ppm

3.3 RX Performance

3. 3. 1 IEEE802.11b mode

Table 11 IEEE802. 11b 20MHz receive sensitivity (dBm)

Channel \ Rate	11M
IEEE spec	
1	-91dBm
2	-91dBm
3	-91dBm
4	-91dBm
5	-91dBm
6	-90dBm
7	89dBm
8	-90dBm
9	-90dBm
10	-90dBm
11	-90dBm
12	-90dBm
13	-90dBm

3.3.2 IEEE802.11g mode 20MHz bandwidth

Table 12 IEEE802.11g 20MHz receive sensitivity(dBm)

Channel \ Rate	54M
IEEE spec	
1	-75dBm
2	-75dBm
3	-75dBm
4	-75dBm

5	-75dBm
6	-74dBm
7	-73dBm
8	-73dBm
9	-74dBm
10	-75dBm
11	-75dBm
12	-75dBm
13	-74dBm

3.3.3 IEEE802.11n-HT mode 20MHz bandwidth

Table 13 IEEE802.11n-HT20 receive sensitivity (dBm)

Channel \ Rate	MCS7
IEEE spec	
1	-71dBm
2	-71dBm
3	-70dBm
4	-71dBm
5	-70dBm
6	-68dBm
7	-68dBm
8	-68dBm
9	-68dBm
10	-70dBm
11	-70dBm
12	-70dBm
13	-70dBm

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4. Antenna Information

4.1 Antenna Type

EMW3060 has two type of antenna, and the part number is EMW3060-P and EMW3060-E。

Figure 4 EMW3060-P

Figure 5 EMW3060-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.

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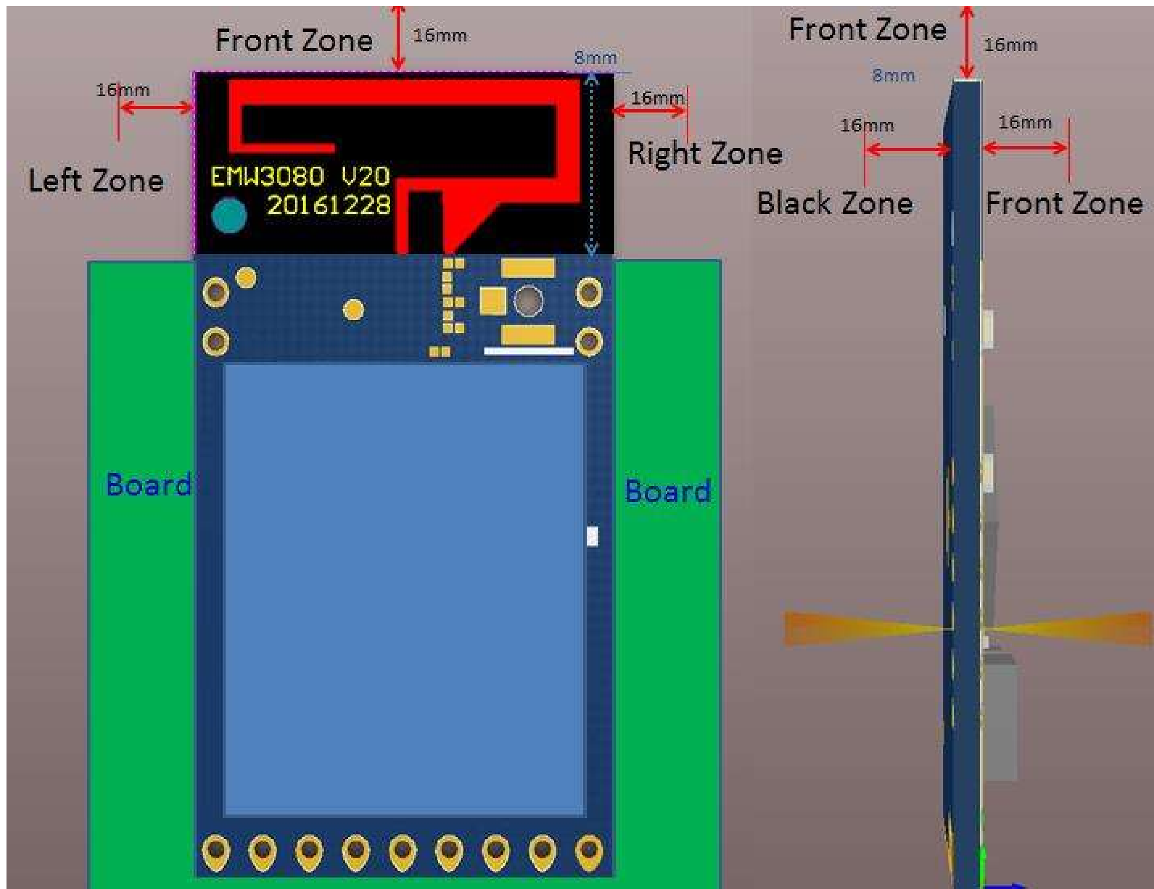

Figure 6 Minimum Clearance Zone of PCB Antenna (Unit: mm)

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4.3 External Antenna Connector

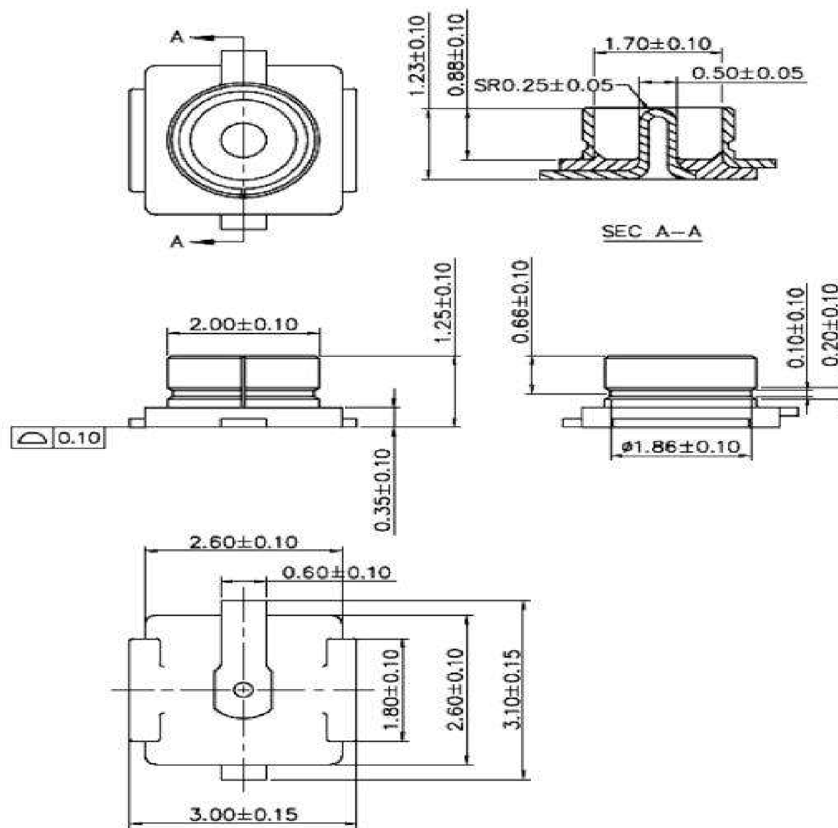
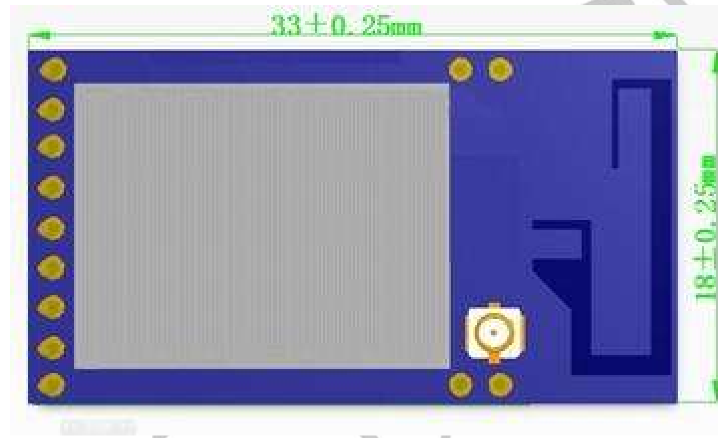


Figure 7 Size of External Antenna Connector

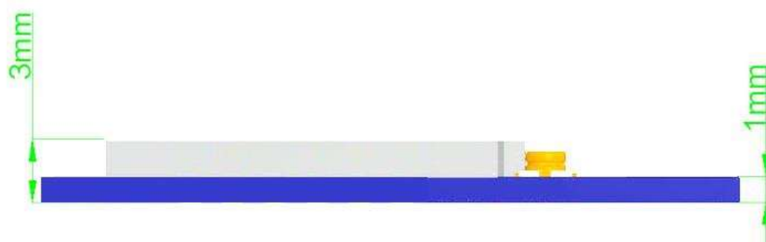
5. Assembly Information and Production Guidance

5.1 Assembly Size



Top View

Left Side View



Side View

Figure 8 EMW3060 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 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 9 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.

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- 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.

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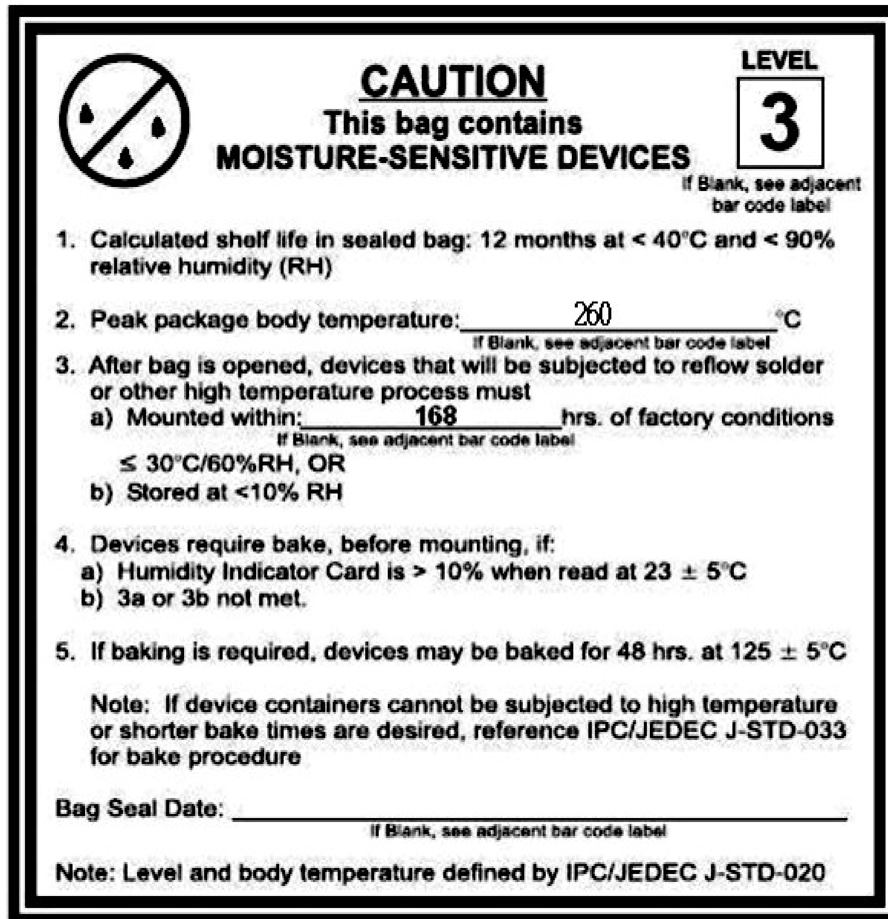
5.4 Storage Condition


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 10 Storage Condition

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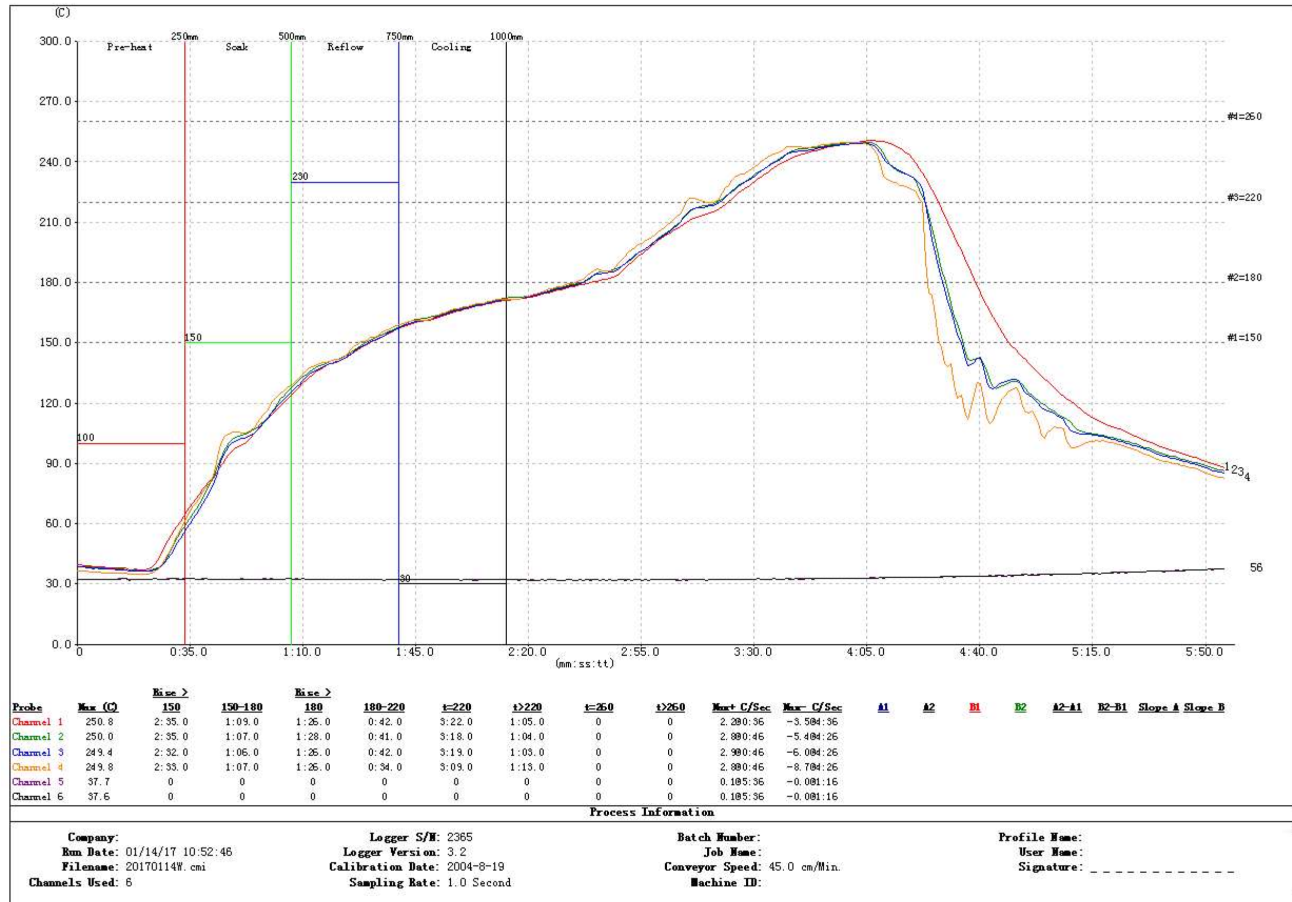
5.5 Temperature Curve of Secondary Reflow

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=260	t>260	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	2.200:36	-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	2.800:46	-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	2.900:46	-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	2.800:46	-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 11 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.

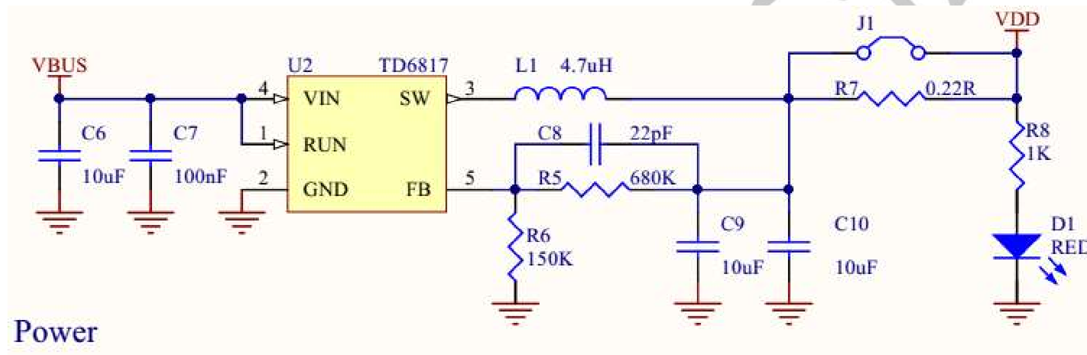


Figure 12 Power Source Circuit

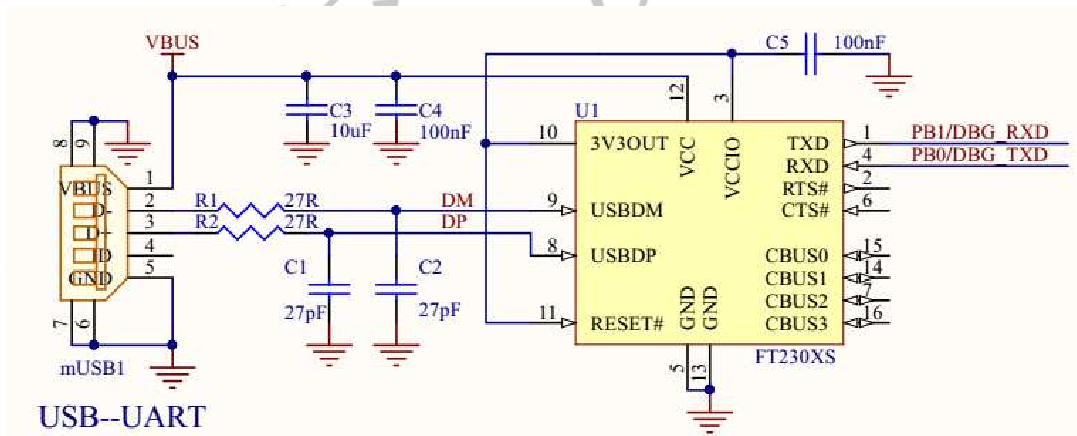


Figure 13 USB to UART

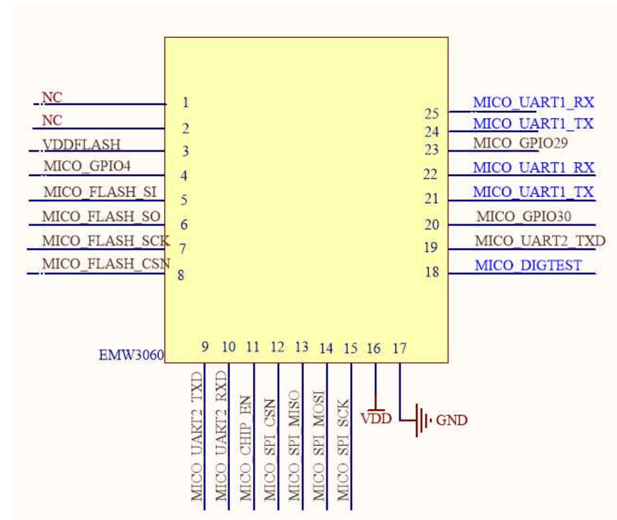


Figure 14 External Interface Circuit of EMW3060

Voltage of EMW3060 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.

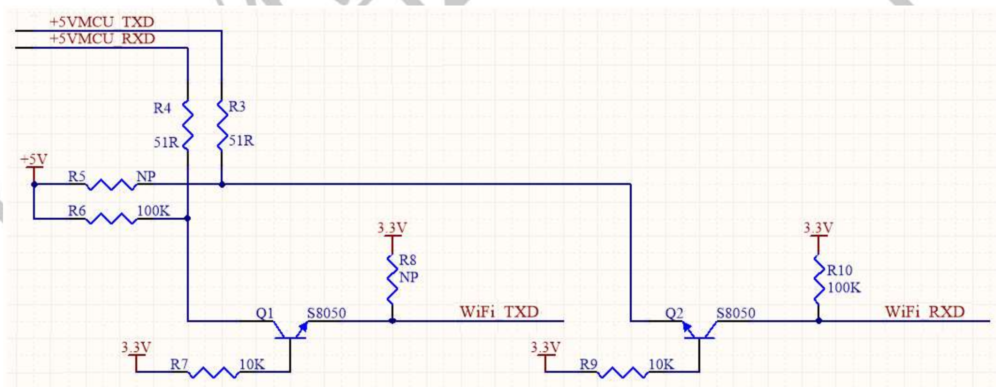


Figure 15 3.3V UART- 5V UART Convert Circuit

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)
EMW3060-P EMW3060-E	480	Tray	48	10+1	480

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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

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

Postcode：200333

Email: sales@mxchip.com

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