

Datasheet**EMW3072****Embedded Wi-Fi Module****Version: 1.2****Date: 2019-07-28****Number: DS0151EN****Abstract****Application****Characteristic**

- Supports 802.11b/g/n standard, integrates ARM-CM4F, WLAN MAC/Baseband/RF.
- Contains 256KB RAM/2MB FLASH
- Operation voltage: DC 3.3V
- 20MHz Bandwidth with maximum data rate at 65Mbps

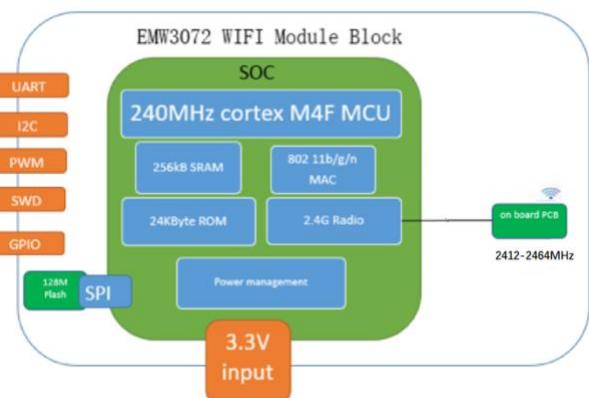
- Intelligent Lighting

- Smart Home/Home Appliances
- Industrial Automation
- Intelligent Security

Module Type

Type	Description
EMW3072	PCB Antenna

- Wi-Fi connectivity
 - Support 802.11b/g/n_ HT-20 standard, and HT-40
 - Support Station, Soft AP, Station+Soft AP
 - Support EasyLink, Alink, Joinlink
- PCB Antenna
- Operation temperature: -30°C to +105°C

Hardware Block

Version Record

Data	Version	Update Note
2019-05-20	1.0	Initial version
2019-05-30	1.1	Revise supply voltage to 3.3V. PWM9 in pin13 function table is corrected to PWM0, PIN14 is removed as the annotation of PWM1. Definition of Pin2 is changed to PWM1 and revised.
2019-07-30	1.2	Increase FCC and IC information

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1. Product Introduction

EMW3072 is a cost-effective embedded WiFi module launched by Shanghai Qingke (MXCHIP). It is highly integrated with ARM CM4F, WLAN MAC/Baseband/RF, with a maximum main frequency of 240MHz, built-in 256KB SRAM, 2M FLASH and 3.3V single power supply.

The following diagram is the hardware block diagram of EMW3072 module, which mainly includes four parts:

- CM4F main core
- WLAN MAC/BB/RF/ANT
- SWD debugging
- Power management

Among them:

1. ARM CM4F CPU, working frequency up to 240MHz, internal integration 256K SRAM, 2MB FLASH, support high-speed UART, I2C, SPI, PWM, and multiple GPIO ports.
2. Extra-chip SPI Flash with maximum support of 128MB for custom firmware development.
3. Supporting PCB antenna and IPEX external antenna
4. Input typical voltage: DC 3.3V

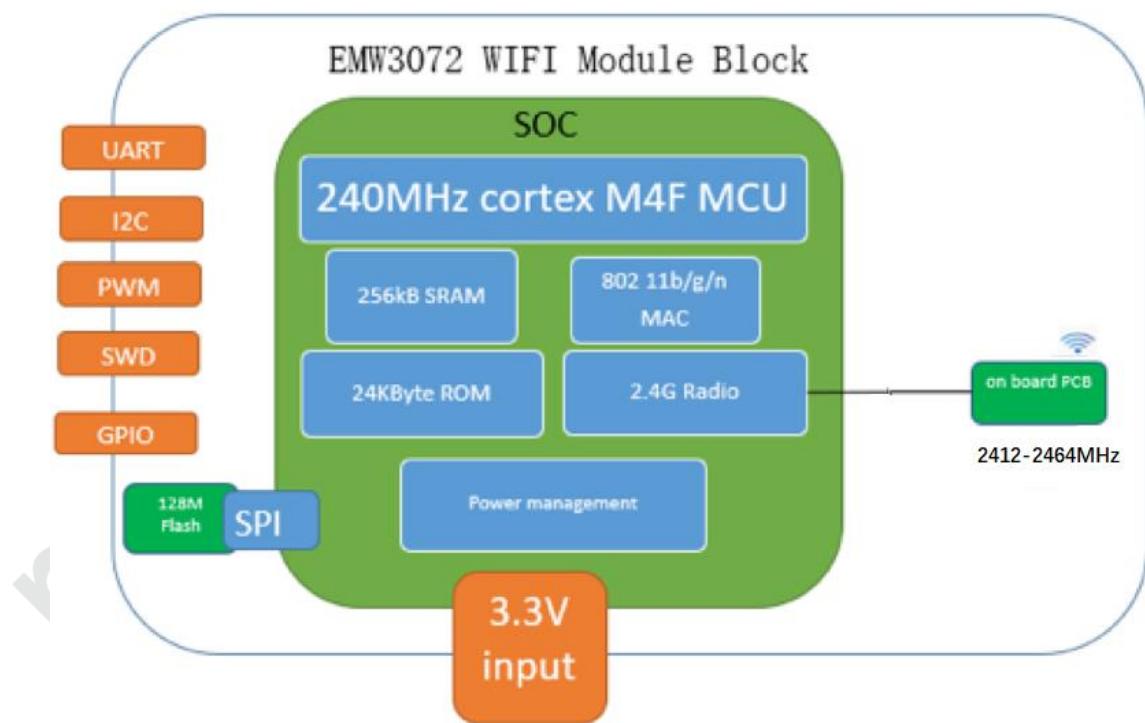


Figure 1 EMW3072 Hardware Block and Interface

1.1 EMW3072 Label Information



Figure 2 EMW3072 label picture

Label Information:

CMIIT ID: XXXXXXXXXXXXXXXX, SRRC Authentication ID.

FCC ID: P53-XXXXXXXX, FCC Authentication ID.

MXCHIP: Company Logo.

EMW3072 : Module Main Model.

D0BAE45000DF: MAC Address(Each module has a unique MAC address).

X1916: Production batch.

0000.0000.A213: Module Firmware Serial 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

EMW3072 adopts the design scheme of stamp hole. The packaging design of stamp hole (as shown in Figure 3 Stamp Hole Packaging Dimension Diagram) is convenient for customers to debug and disassemble.

The size of welding pad and window is the same. SMT suggests that the thickness of steel mesh be 0.12mm-0.14mm.

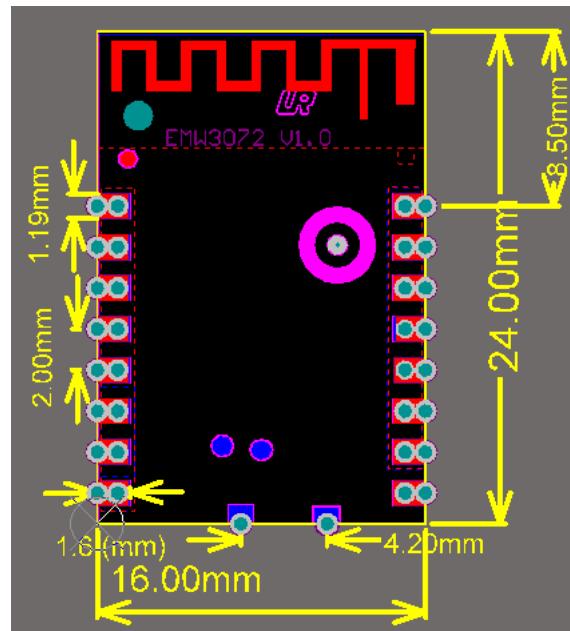


Figure 3 Stamp Hole Packaging Dimension Diagram

TOP VIEW

1.3 Pin Definition

1.3.1 EMW3072 Package Definition

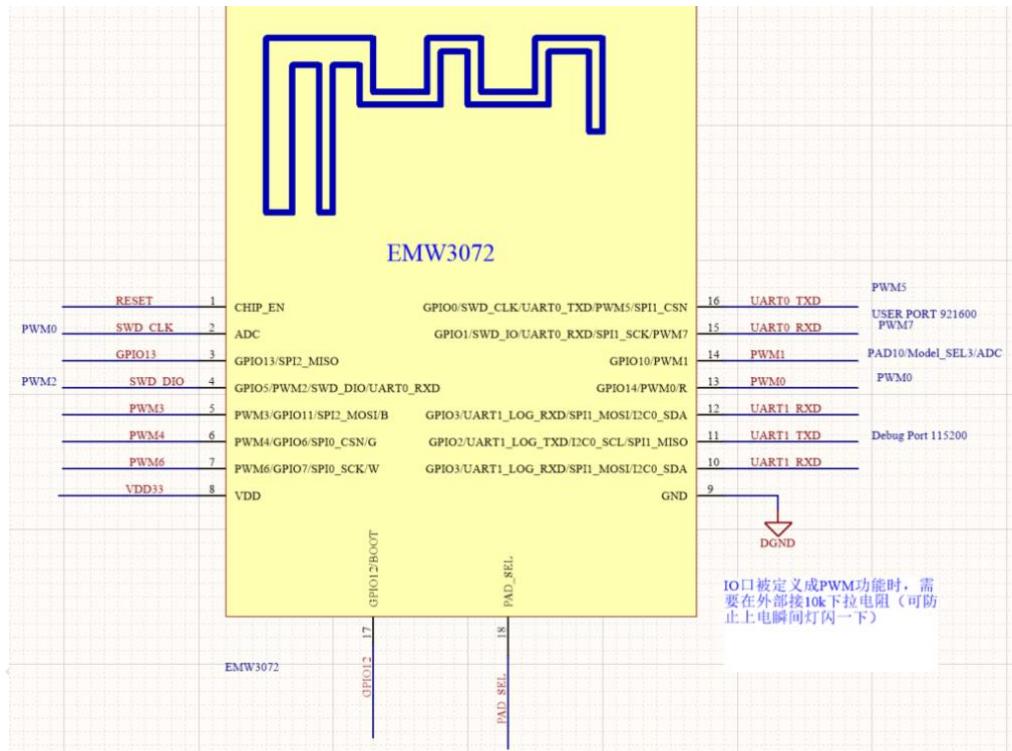


Figure 4 EMW3072 Packaging Definition Diagram

1.3.2 EMW3072 Pin Definition

Table 1 EMW3072 pin definition

引脚号	FUNCTION1	FUNCTION2 SDIO	FUNCTION3 UART	FUNCTION4 PWM	FUNCTION5 SPI	FUNCTION6 GPIO
1	RESET					
2	SWD_CLK	SDIO_CMD	UART0_TXD	PWM0	ADC1	GPIO_4
3	ELINK		UART2_RXD		SPI2_SCK	GPIO_13
4	SWD_DIO	SDIO_CLK		PWM2	ADC2	GPIO_5
5		SDIO_INT	UART2_RTS	PWM3	SPI2_MOSI	GPIO_11
6	ADC3	SDIO_DATA0	UART0_CTS	PWM4	SPI0_CSN	GPIO_6
7	ADC4	SDIO_DATA1	UART0_RTS	PWM6	SPI0_SCK	GPIO_7
8	VDD33					
9	GND					

10	I2C0_SDA	SDIO_INT	UART1_RXD		SPI1_MOSI	GPIO_3
11	I2C0_SCL		UART1_TXD		SPI1_MISO	GPIO_2
12	I2C0_SDA	SDIO_INT	UART1_RXD		SPI1_MOSI	GPIO_3
13	STRAP/SEL1		UART1_CTS	PWM0	SPI2_SCK	GPIO_14
14	MODE_SEL3	ADC7	UART1_CTS	PWM1	SPI2_SCK	GPIO_10
15	SWD		UART0_RXD	PWM7	SPI1_SCK	GPIO_1
16	SWC		UART0_TXD	PWM5	SPI1_CS_N	GPIO_0
17	BOOT		UART2_TXD		SPI2_CS_N	GPIO_12
18	PAD_SEL					

Description:

(1) PIN 17 pin is used by BOOT by default, PIN 3 pin is used by EASYLINK, PIN 21/22 pin is used by debugging log information output. Please try not to use it in hardware design. If you want to use it, please contact our engineer to confirm.

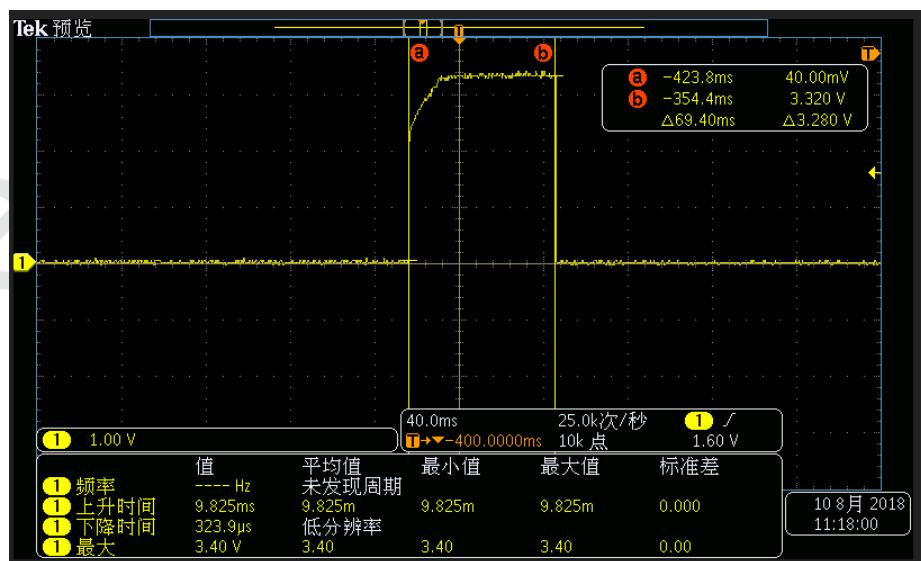
(2) PIN11/12 pin must be High level while it's power on, and it can be pull-up by externally connecting with 100k resistance. Please pay special attention to the design of the circuit.

(3) In order to enable pins, CHIP_EN pulls down the resettable module and then pulls up the resettable module. If not used, it can remain suspended or pull up 3.3V at 10K.

(4) PIN11/12 can be internal 100k weak pull-up, please allocate related peripheral devices reasonably.

(5) PIN18 can be used to choose PAD mode, which is raised when burning, and floating usually.

(6) Other non-pins can be kept in suspension. It should be noted that IO port is a floating state at startup. This is true from the beginning of ROM code. It can be pulled up and down in boot code as soon as possible, and the time it takes will be affected by flash. Therefore, if the module needs to be in the level state determined by module at startup, it needs to be added to the outside that less than 100k resistor pulled up and down to stabilize the level. As shown in the figure below, when the module is started, the level of the IO port, which is configured to be very low, is changed when the floating state is pulled up by an external 100K resistor.



2. Electrical Parameters

2.1 Operating Ratings

Be noticed that when the input voltage is lower than the minimum rated voltage, EMW3072 may work abnormally.

Please pay attention while designing power circuit.

Table 2 Input voltage range

Symbol	Description	Condition	Detail			
			Min.	Typ.	Max.	Unit
VDD	Power supply		3.0	VDD	Power supply	V

Voltage exceeding maximum ratings will cause hardware damage to the module and working at the maximum ratings for a long time will affect the reliability of the module.

Table 3 Absolute Maximum Ratings

Symbol	Description	Min.	Typ.	Unit
VDD	Power supply	-0.3	3.6	V
VIN	Input voltage of GPIOs	-0.3	3.6	V

2.2 Power Consumption

Test temperature: room temperature

Test distance: 20~50cm

Table 4 Power Consumption Parameters

Mode	Circuit		Description
	Average	Maximum	
Run mode	10.2	10.6	Wi-Fi RF is off, MCU is running in Task State
Idle mode	7.6	8.2	Wi-Fi RF is off, MCU is in Idle state, system automatically enters low power mode
Station Tx Power	57.8mA	212.5mA	Wi-Fi is in connection state, sending broadcast packet state (data interval 10ms)
Station Rx Power	55.9mA	92.7mA	Wi-Fi is in connection state, receiving broadcast packet state (data interval 10ms)
Station Tx Rx Power	52.1mA	191.5mA	Wi-Fi is in connection state, TCP/IP data is in sending and receiving status (data interval 10ms)
SoftAP mode	59.2mA	180.8mA	Wi-Fi start SoftAP mode and connect devices

Power Save mode(Idle)	12.4mA	58.3mA	Wi-Fi is in connection state, MCU is in idle state
Monitor mode	56.5mA	59.3mA	Wi-Fi start monitor mode

Notice: the power consumption data may be different in different firmware. MAX working circuit is 290mA.

2.3 Operation Conditions

Table 5 Temperature and Humidity conditions

Symbol	Name	Range	Unit
TSTG	Storage Temperature	-40 to +85	°C
TA	Operating Temperature	-20 to +85	°C
Humidity	Non-condensing, relative humidity	<95	%

2.4 ESD Parameters

Table 6 ESD Parameters

Symbol	Name	Spec	Rank	Max.	Unit
V _{ESD} (HBM)	Electronics Static Discharge (Human Body Model)	TA = +25 °C JESD22-A114	2	2000	V
V _{ESD} (CDM)	Electronics Static Discharge (Charge Device Model)	TA = +25 °C JESD22-C101	II	500	V

3. RF Parameters

3.1 Basic RF Parameters

Table 7 RF Standard

Item		Description
Frequency Range		2412~2.462MHz
Wi-Fi Wireless Standard		IEEE802.11b/g/n
Modulation Mode		11b: DBPSK, DQPSK,CCK for DSSS 11g: BPSK, QPSK, 16QAM, 64QAM for OFDM 11n: MCS0~7,OFDM
Data Rate	20MHz	11b: 1,2,5.5 和 11Mbps 11g : 6,9,12,18,24,36,48,54Mbps 11n : MCS0~7,65Mbps
Antenna Type		PCB antenna (Default)

3.2 TX Performance

3.2.1 IEEE802.11bMode Tx Parameters

Table 8 IEEE 802.11b Mode CCK_11 Tx Parameters

Item	Description				
Mode	IEEE802.11b				
Channel	CH1 to CH13				
Rage	1, 2, 5.5, 11Mbps				
TX Performance	Minimum	Typical.	Maximum	Unit	Remark
1.Output Power	15.0	16.5	18.0	dBm	1Mbps
	15.0	16.5	18.0	dBm	11Mbps
2. Spectrum Template					
1) fc +/-11MHz to +/-22MHz	-	-	-30	dBr	
2) fc > +/-22MHz	-	-	-50	dBr	

3. Frequency Offset	-15	-1.5	+15	ppm	
4. EVM(Peak EVM)					
1) 1~11Mbps			35% (or 11dB)		

3.2.2 IEEE802.11g mode TX Performance

Table 9 IEEE802.11g Mode OFDM_54 TX Performance Parameters

Item	Description				
Mode	IEEE802.11g				
Channel	CH1 to CH13				
Rate	6, 9, 12, 18, 24, 36, 48, 54Mbps				
TX Performance	Minimum	Typical.	Maximum	Unit	Remark
1. Output Power	14.0	15.5	17	dBr	6Mbps
	13.0	14.5	16	dBr	54Mbps
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	-1.5	+15	ppm	
4. EVM(Peak EVM)					
6Mbps	-	-30	-5	dBr	
54Mbps	-	-31	-25	dBr	

3.2.3 IEEE802.11n-HT Mode TX Performance

Table 10 IEEE802.11n-HT 20MHz Mode MCS7 TX Performance

Item	Description				
Mode	IEEE802.11n HT20				
Channel	CH1 to CH13				
Rate	MCS0/1/2/3/4/5/6/7, maximum 65Mbps				
TX Performance	Minimum	Typical.	Maximum	Unit	Remark
	13.5	15	16.5	dBm	MCS0
1. Output Power	12	13.5	15.0	dBm	MCS7
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	-1.5	+15	ppm	
4. EVM(Peak EVM)					
MCS0	-	-30	-5	dBm	
MCS7	-	-32	-27	dBm	

3.3 RX Performance

3.3.1 IEEE802.11b Mode RX Performance

RX Minimum Receiving Sensitivity	Minimum	Typical.	Maximum	Unit	Remark
1Mbps (FER≤8%)	-	-98	-97	dBm	
11Mbps (FER≤8%)	-	-90	-90	dBm	

3.3.2 IEEE802.11g. Mode RX Performance

RX Minimum Receiving Sensitivity	Minimum	Typical.	Maximum	Unit	Remark
6Mbps (FER≤10%)	-	-92.5	-92.5	dBm	
54Mbps (FER≤10%)	-	-76	-75.5	dBm	

3.3.3 IEEE802.11n HT20 Mode RX Performance

RX Minimum Receiving Sensitivity	Minimum	Typical.	Maximum	Unit	Remark
MCS0 (FER≤10%)	-	-92.5	-92	dBm	
MCS7 (FER≤10%)	-	-73	-73	dBm	

3.3.4 IEEE802.11n HT40 Mode RX Performance

RX Minimum Receiving Sensitivity	Minimum	Typical.	Maximum	Unit	Remark
MCS0 (FER≤10%)	-	-90	-90	dBm	
MCS7 (FER≤10%)	-	-70	-70	dBm	

Note:

Tx test data above are typically recorded at room temperature for about 20 seconds.

11b power is measured in factory mode (through-the-wall mode). User's practical application and authentication test will be 2 dB lower than that in factory mode, i.e. the actual maximum power limit of 11b is 16 dBm. Ensure that the PSD test items of the certification test pass.

3.3.5 OTA Performance

TBD

4. Antenna Information

4.1 Antenna Type

EMW3072 only has PCB antenna model.



Figure 5 EMW3072 Drawings

Table 11 PCB Antenna

PCB Antenna Information	
Frequency Range	2412MHz~2462MHz
Impedance	50Ω
VSWR	<2
Gain	2dBi≥Gain>0.8dBi
Efficiency	>50% or >-3dB

Note: The above conditions are obtained under the condition of module welding to motherboard and darkroom testing.

4.2 PCB Antenna Forbidden Area

While using PCB antenna, make sure that metal and electrical components are at least 16mm away from the antenna.

The shadow area should not contain any metal components, sensor, PCB ground.

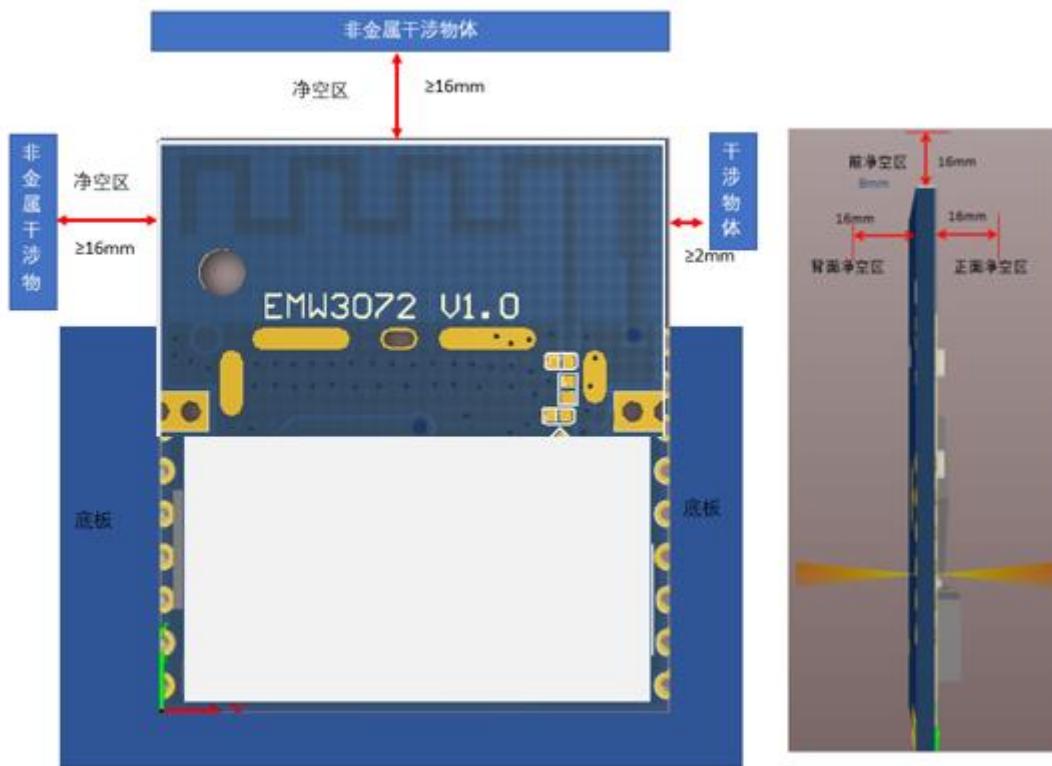


Figure 6 PCB Minimum clearance area of antenna (Unit: mm)

5. Production Instruction

5.1 Production Guidelines

Qingke stamp port packaging module must be SMT machine patches, module humidity sensitivity grade MSL3, after unpacking more than a fixed time patches to bake module.

SMT need machine:

1. Reflow soldering SMT machine
2. The AOI detector
3. 6-8 mm diameter suction nozzle

Baking need equipment:

1. Cabinet baking box
2. The antistatic, high temperature resistant tray
3. The antistatic high temperature resistant gloves

Storage conditions as follows:

1. Moisture bag must be stored in a temperature < 30 ° C, humidity 85% RH of the environment.
2. Dry packaging products, the guarantee period should be from 6 months from the date of packing seal.



Figure 7 Humility Card

- After the module is split, if the humidity card shows pink, it needs to be baked.
- Baking Parameters:
 - Roasting temperature: $12^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and baking time: 4 hours.
 - The alarm temperature is set to 130 C.
 - SMT patches can be prepared after cooling < 36 C under natural conditions.
 - Drying times: 1 time.
 - If there is no welding after baking for more than 12 hours, please bake again.

- 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 °C, reflow soldering temperature curve as shown in figure 10, section 5.5;
- 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.

5.2 The matters need 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 °C before wearing 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.

5.3 Storage Condition



Figure 8 Storage Condition

5.4 Recommended Reflow Profile

Solder paste recommendations: SAC305, Lead -Free solder paste. Reflow times should be no more than twice.

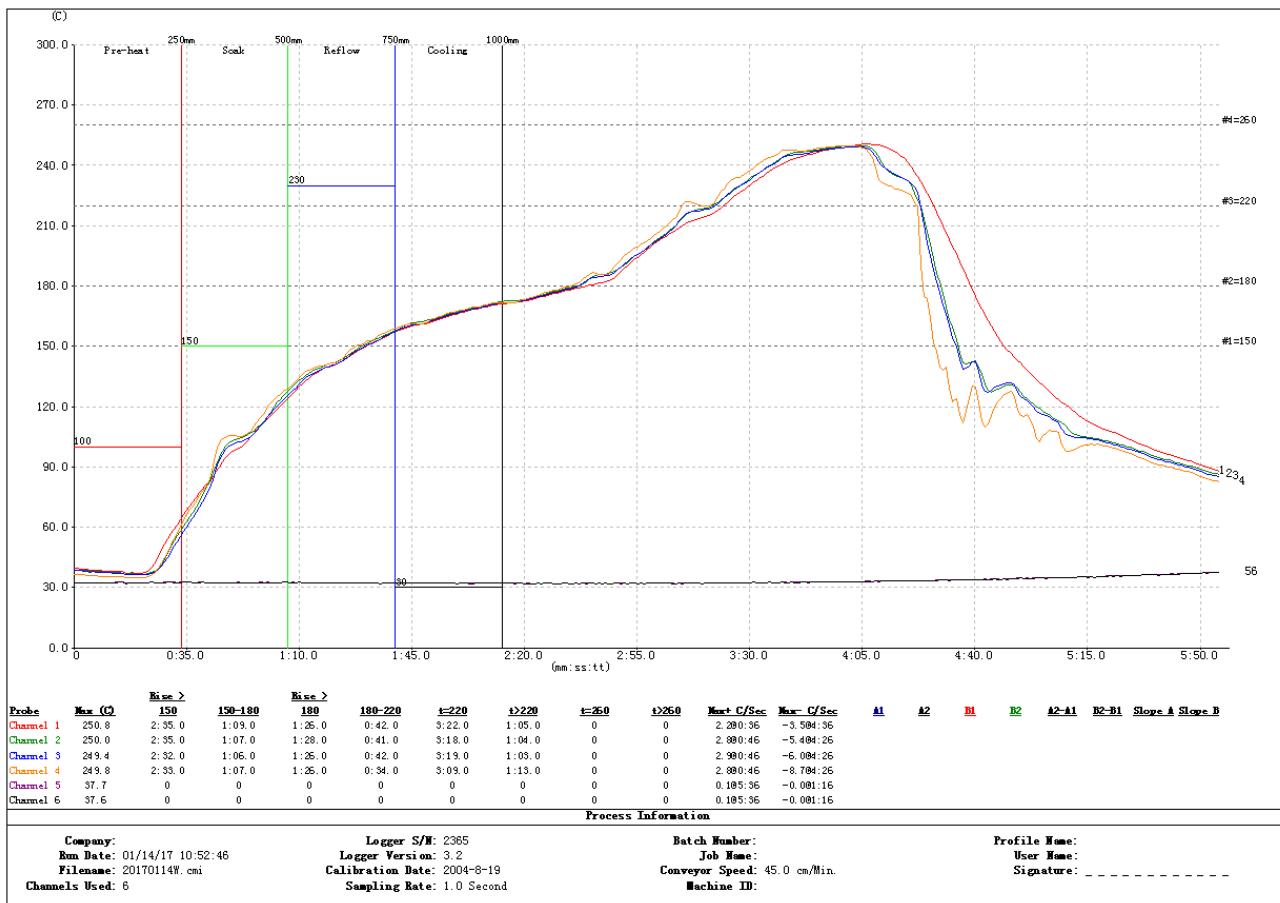


Figure 9 Temperature Curve Reference

6. Reference Circuit

The EMW3072 power supply reference circuit is shown in Figure 10, Figure 10 USB serial port reference circuit and Figure 11 external interface reference design for user reference.

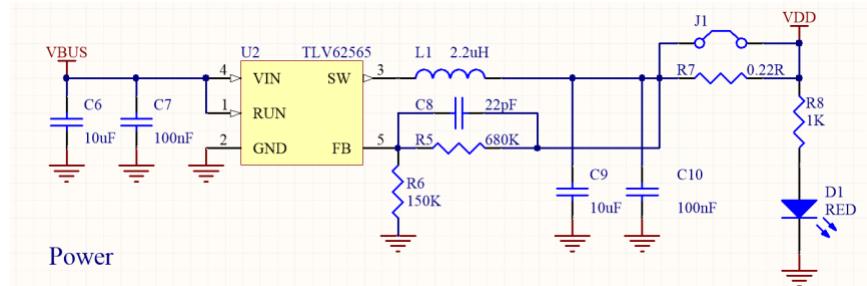


Figure 10 Power Reference Circuit

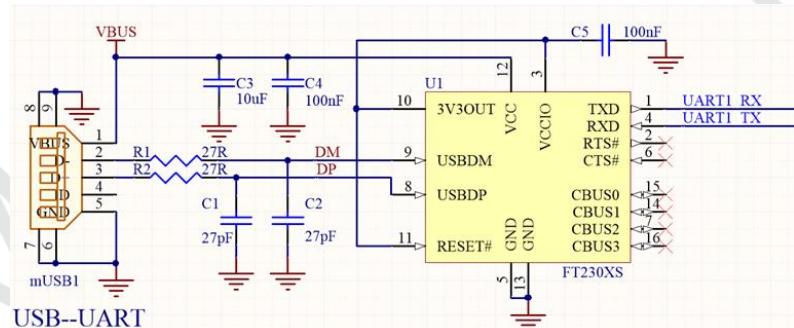


Figure 11 USB to UART Reference Circuit

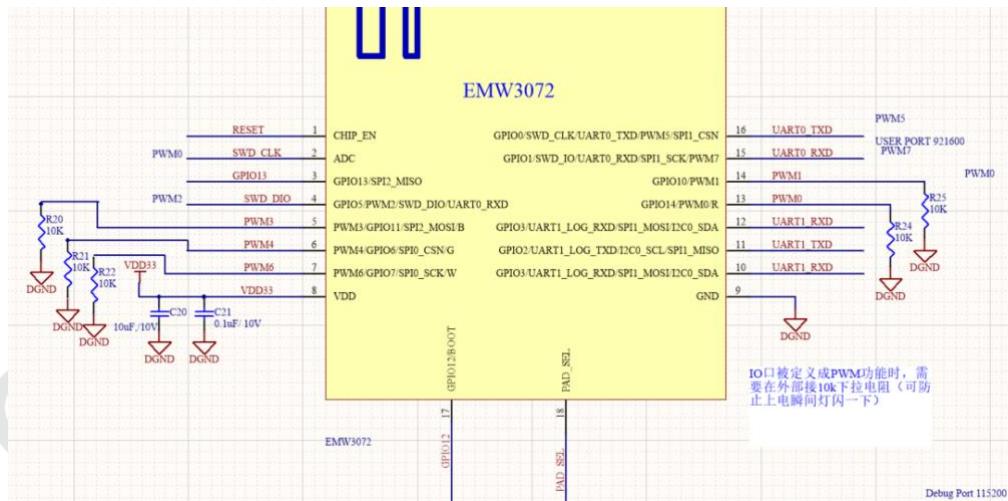


Figure 12 EMW3072 External Interface Reference Design

EMW3072 UART is 3.3V UART. If the UART of the chip is 5V, the user needs to convert 5V UART to 3.3V UART to communicate with EMW3072 UART. The 5V-3.3V UART conversion circuit refers to the circuit shown in Figure 13.

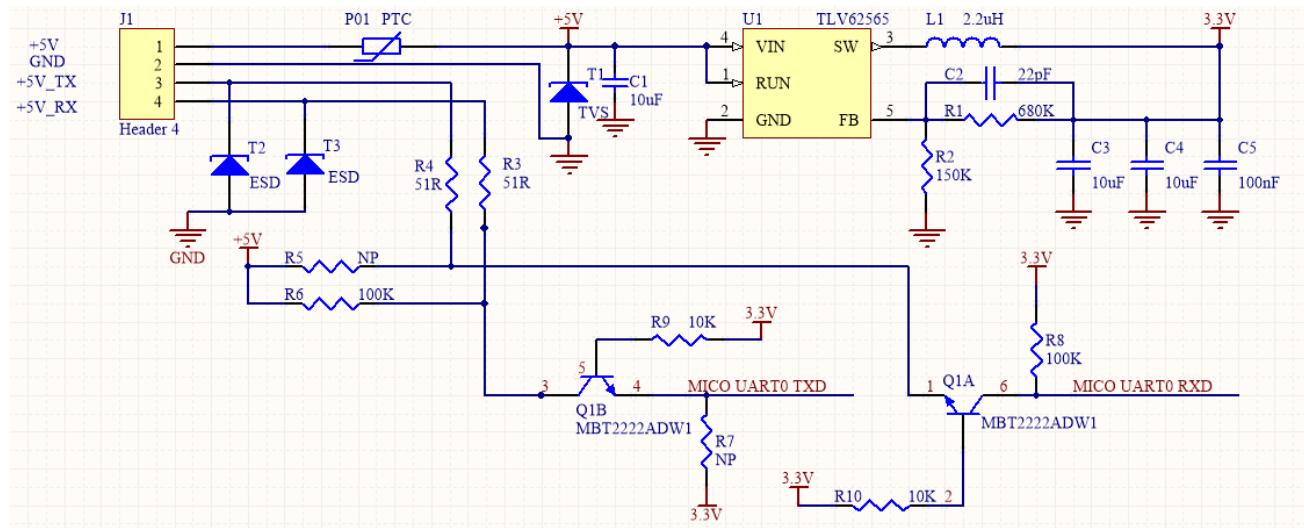


Figure 13 3.3V UART- 5V UART Conversion Reference Circuit

7. FCC and IC Information

7.1 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 installed and operated with minimum distance 20cm between the radiator & your body.

7.2 IC warning

- English:

This device complies with Industry Canada license-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 présent appareil est conforme aux CNR d'Industrie Canada applicable aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

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

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Note: The host product manufacturers need to provide a physical or e-label stating “Contains FCC ID” with their finished product.

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8. Module MOQ and packaging information

Table 12 Module MOQ and packaging information

Material number	MOQ(pcs)	Shipment packing method	Outer packing box size	Remark
EMW3072	650	Tape reel	385*275*370(mm)	650pcs/volume , one volume in one box four boxes in one case.

9. 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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