Data Sheet

EMW3280

Embedded Wi-Fi module

3.2 **Date : 2013-08-11** **Data Sheet**

Overview

EMW3280 is a powerful Wi-Fi module designed for embedded devices. EMW3280 has a CE, FCC-compliant IEEE 802.11 b/g/n MAC /baseband /radio which support multiple Wi-Fi working modes and power save modes. EMW3280 has reached an ideal balance between performance and power consumption.

EMW3280 has a Cortex-M3 MCU: STM32F215RG with rich peripherals, 1M bytes flash and 128k bytes SRAM. Users can build their own embedded Wi-Fi applications based on **mxchipWNet™** library which manage all of the Wi-Fi MAC and TCP/IP stack processing. We also provide several **mxchipWNet™** firmware to meet typical applications: wireless UART, wireless audio, wireless sensor etc.

Applications

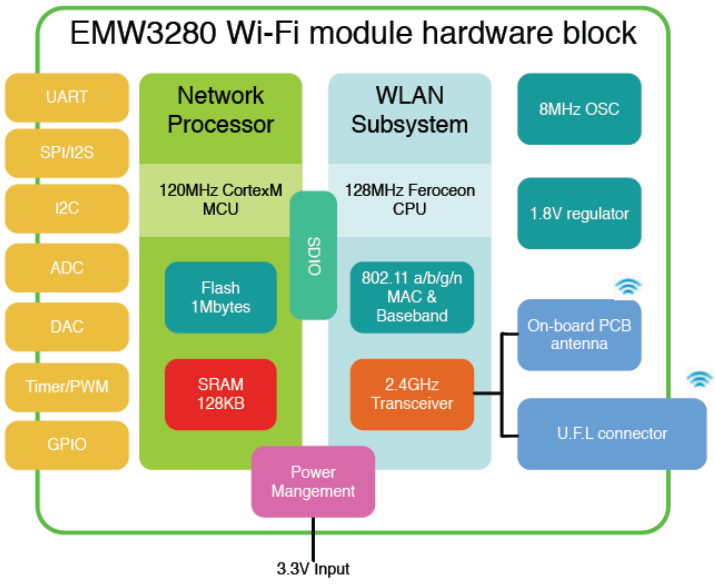
- Building Automation / Access Control
- Smart home appliances
- Medical/Health Care
- Industrial Automation Systems
- Point Of Sale system (POS)
- Auto electronics
- Communicate with smart phones and tablets

Product list

Module	-	Antenna	
EMW3280	-	P	On-board PCB antenna
	-	E	IPEX connector

Firmware/Library	Function
mxchipWNet™ - DTU	Predefined firmware: UART/Wi-Fi conversion
mxchipWNet™ Library	Basic Software library used to develop custom firmware
mxchipWNet™ -HA	An easy to use firmware and library based on a predefined network framework

Hardware block



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1 Introduction

EMW3280 is a powerful Wi-Fi module designed for embedded devices, such as home automation, toys, health care, automobile electronics and I.o.T solutions. EMW3280 has a CE, FCC-compliant IEEE 802.11 b/g/n MAC/baseband/radio which support multiple Wi-Fi working modes and power save modes. EMW3280 has reached an ideal balance between performance and power consumption.

EMW3280 has a Cortex-M3 MCU with rich peripherals, users can build their own embedded Wi-Fi applications based on **mxchipWNet™** library which manage all of the Wi-Fi MAC and TCP/IP stack processing. We also provide several **mxchipWNet™** firmware to meet typical applications: wireless UART, wireless audio, wireless sensor etc.

When using **mxchipWNet™** -DTU firmware, you can establish Wi-Fi networking for any device with a micro-controller and UART interface. Quick development cycles enables fast time to market.

1.1 Features

- ★ Single operation voltage：3.3V
- ★ Power consumption: <220mA under running mode, <1mA under standby mode.
- ★ CPU frequency: 120MHz，flash size: 1M bytes，RAM size128k bytes.
- ★ Peripherals：
  - 26 x GPIOs
  - 2 x UARTs，includes hardware flow control
  - 1 x SPI/I2S
  - 6 x ADC input channels，1 DAC output channel
  - 1 x USB OTG, 2 x CAN
  - 1 x I2C
  - PWM/Timer input/output available on every GPIO pin
  - SWD debug interface
- ★ Wi-Fi connectivity
  - IEEE 802.11 b/g/n on channel 1-13
  - WEP, WPA/WPA2 PSK/Enterprise
  - Transmit power：18dBm@11b，15dBm@11g，15dBm@11n
  - Data rate：11Mbps@11b，54Mbps@11g，72Mbps@11n HT20，150Mbps@11n HT40
  - Wi-Fi modes：Ad-Hoc，Station 和 Soft AP
  - WPS 2.0, Wi-Fi Direct
  - Multiple power save modes: Standby，stop and IEEE power save mode
  - On-board PCB antenna，IPEX connector for external antenna
  - CE，FCC compliant

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2 Interface

2.1 Led

Table 2.1 LED functions

Name	Color	GPIO
D1	Green	PB0
D2	Red	PB1

2.2 Pinouts

EMW3280 has two groups of pins (1X15 +1X15). The lead pitch is 2mm.

EMW3280’ s pinout is shown in the Figure 2.1. Table 2.2 lists the pin functions.

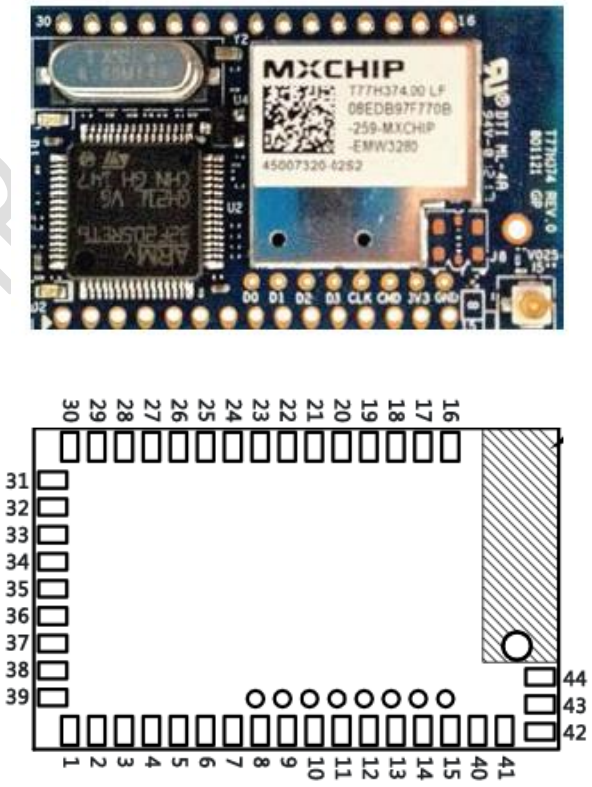

Figure2.1 EMW3280: appearance and pinout

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2.3 Pin Arrangement

Figure 2.2 EMW3280 pin arrangement

Pins	Name	Type	IO level	Main function (after reset)	Alternate functions	Other functions
1	PB6	I/O	FT	PB6	I2C1_SCL/ USART1_TX / TIM4_CH1 / CAN2_TX	
2	PB7	I/O	FT	PB7	I2C1_SDA / USART1_RX/ TIM4_CH2	
3	PA13	I/O	FT	SWDIO		
4	PC7	I/O	FT	PC7	I2S3_MCK / TIM8_CH2/ TIM3_CH2 / USART6_RX	
5	PA3	I/O	FT	PA3	TIM5_CH4 / TIM9_CH2 / TIM2_CH4 /	ADC123_IN3
6	PA4	I/O	TT	PA4	SPI1_NSS / SPI3_NSS / I2S3_WS	ADC12_IN4 / DAC1_OUT
7	PB3	I/O	FT	JTDO/ TRACESWO	JTDO/ TRACESWO/ I2S3_SCK / TIM2_CH2 / SPI1_SCK / SPI3_SCK/	
8	PB4	I/O	FT	NJTRST	NJTRST/ SPI3_MISO / TIM3_CH1 / SPI1_MISO/	
9	PB5	I/O	FT	PB5	I2C1_SMBA / TIM3_CH2 / SPI1_MOSI/ SPI3_MOSI / CAN2_RX	
10	PB8	I/O	FT	PB8	TIM4_CH3 / TIM10_CH1 / I2C1_SCL / CAN1_RX	
11	PA1	I/O	FT	PA1	TIM5_CH2 / TIM2_CH2	ADC123_IN1
12	PC2	I/O	FT	PC2		ADC123_ IN12
13	PB14	I/O	FT	PB14	TIM1_CH2N / TIM12_CH1 / TIM8_CH2N/	
14	PC6	I/O	FT	PC6	TIM8_CH1 / TIM3_CH1 / USART6_TX	
15	GND					
31~44	GND					
16	PB1			PB1	TIM3_CH4 / TIM8_CH3N/ TIM1_CH3N/	ADC12_IN9
17	nRESET					
18	PA15	I/O	FT	JTDI	JTDI/ SPI3_NSS/ I2S3_WS/ TIM2_CH1_ETR / SPI1_NSS	
19	PB11	I/O	FT	PB11	TIM2_CH4	

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Pins	Name	Type	IO level	Main function (after reset)	Alternate functions	Other functions
20	PA12	I/O	FT	PA12	USART1_RTS / CAN1_TX/ TIM1_ETR/ OTG_FS_DP	
21	PA11	I/O	FT	PA11	USART1_CTS / CAN1_RX / TIM1_CH4 / OTG_FS_DM	
22	PA9	I/O	FT	PA9	USART1_TX/ TIM1_CH2	OTG_FS_VBUS
23	PA10	I/O	FT	PA10	USART1_RX/ TIM1_CH3/ OTG_FS_ID	
24	VCC					
25	GND					
26	NC					
27	BOOT0	I		BOOT0		
28	PA14			JTCK- SWCLK	JTCK-SWCLK	
29	PA0-WKUP			PA0-WKUP	TIM2_CH1_ETR/ TIM5_CH1 / TIM8_ETR	ADC123_IN0/ WKUP
30	PB9			PB9	TIM4_CH4/ TIM11_CH1 / I2C1_SDA / CAN1_TX	

1. T = 5 V tolerant;
2. STM32 peripherals are not listed if they cannot be presented on current pins

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3 Electrical Parameters

3.1 Absolute maximum ratings: Voltage & Current

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.

Symbol	Ratings	Min	Max	Unit
V_{DD}–V_{SS}	Voltage	–0.3	4.0	V
V_{IN}	Input voltage on five volt tolerant	VSS –0.3	5.5	V
V_{IN}	Input voltage on any other pin	VSS –0.3	VDD+0.3	V

Symbol	Ratings	Max	Unit
I_{VDD}	Total current into VDD power lines (source)	320	mA
I_{VSS}	Total current out of VSS ground lines (sink)	320	
I_{IO}	Output current sunk by any I/O and control pin	25	
	Output current source by any I/Os and control pin	-25	

3.2 Operating conditions: Voltage & Current

Symbol	Note	Conditions	Specification			
			Min.	Typical	Max.	Unit
V_{DD}	Voltage		3.0	3.3	3.5	V
I_{VDD}	Working Current	VDD=3.3V , 11b 1M @18dBm TCP TX Speed : 80kbytes/s	219	224	230	mA
I_{VDD}	Working Current	VDD=3.3V , 11b 1M @18dBm TCP TX Speed : 10kbytes/s	199	202	204	mA
I_{VDD}	Working Current	VDD=3.3V , 11g 54M @15dBm TX Speed : 80kbytes/s	203	204	205	mA
I_{VDD}	Working Current	VDD=3.3V , 11g 54M @15dBm TX Speed : 10kbytes/s	199	200	202	mA
I_{VDD}	Tx Current	VDD=3.3V , 11b 1M @18dBm	284	291	300	mA
I_{VDD}	Tx Current	VDD=3.3V , 11g 54M @15dBm	206	217	228	mA
I_{VDD}	Tx Current	VDD=3.3V , 11n HT20 @15dBm	190	197	210	mA
I_{VDD}	Rx Current	VDD=3.3V	182	185	188	mA

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Symbol	Note	Conditions	Specification			
			Min.	Typical	Max.	Unit
I_{VDD}	IEEE Power Save Current	VDD=3.3V	38	38	39	mA
I_{VDD}	Standby Current	VDD=3.3V		50	60	uA

1. Average current。

3.3 Digital I/O port characteristics

3.3.1 Output voltage levels

Symbol	Note	Parameter	Conditions	Min.	Max.	Unit
V_{OL}	UART& IO output voltage	Output low level voltage	I_{IO}= +8 mA 2.7 V < VDD < 3.6 V		0.4	V
V_{OH}		Output high level voltage		VDD-0.4		V
V_{OL}		Output low level voltage	I_{IO}= +20 mA 2.7 V < VDD < 3.6 V		1.3	V
V_{OH}		Output high level voltage		VDD-1.3		V

3.3.2 Output voltage levels

Symbol	Note	Parameter	Conditions	Min.	Max.	Unit
V_{IL}	UART& IO input voltage	Input low level voltage	TTL level	-0.5	0.8	V
V_{IH}		Input high level voltage		2	VDD+0.5	V
		Input high level voltage (5V input tolerant)		2	5.5	V
V_{IL}		Input low level voltage	CMOS level	-0.5	0.35VDD	V
V_{IH}		Input high level voltage		0.65VDD	VDD+0.5	V

3.3.3 nRESET pin characteristics

The nRESET pin input driver uses CMOS technology. EMW3280 contains RC (resistance-capacitance) reset circuit which ensures the module reset accurately when it powers up. If you need to reset manually, just connect the external control signals to the reset pins directly, but the control signal should be Open Drain Mode。

Symbol	Item	Conditions	Min.	Typical	Max.	Unit
$V_{IL(NRST)}$	/RESET input low level		–0.5		0.8	V
$V_{IH(NRST)}$	/RESET input high level		2		VDD+0.5	
R_{PU}	Resistor for Pulling up	V_{IN}= VSS	7.5	8	8.3	kΩ

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C_{PD}	Capacitor for charging and Resetting			100	1000	pF

3.4 Other MCU electrical parameters

Please refer to STM32F215RGT6 data sheet.

3.5 Absolute maximum ratings: Temperature

Symbol	Ratings	Max	Unit
T_{STG}	Storage temperature	–55 to +125	℃
T_A	Working temperature	-10 to +80	℃

3.6 Absolute maximum ratings: The Electromagnetic Environment Electrostatic discharge (ESD)

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
VESD(CDM)	Electrostatic discharge voltage (charge device model)	TA = +25 °C conforming to JESD22-C101	II	500	

3.7 Static latch-up

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

Symbol	Parameter	Class	Class
LU	Static latch-up class	TA= +105 °C conforming to JESD78A	II level A

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3.8 RF characteristics

3.8.1 Basic RF characteristics

Item	Specification
Operating Frequency	2.412~2.472GHz
Wi-Fi Standard	802.11b/g/n(1x1) *
Modulation Type	11b: DBPSK, DQPSK,CCK for DSSS 11g: BPSK, QPSK, 16QAM, 64QAM for OFDM 11n: MCS0~7,OFDM *
Data Rates	11b:1, 2, 5.5 and 11Mbps 11g:6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~7, up to 150Mbps
Antenna type	One U.F.L connector for external antenna PCB printed ANT (Reserve)

3.8.2 IEEE802.11b mode

Item	Specification
Modulation Type	DSSS / CCK
Frequency range	2400MHz~2483.5MHz
Channel	CH1 to CH13
Data rate	1, 2, 5.5, 11Mbps

TX Characteristics	Min.	Typical	Max.	Unit
Transmitter Output Power				
11bTarget Power	16	18	20	dBm
Spectrum Mask @ target power				
fc +/-11MHz to +/-22MHz			-30	dBr
fc > +/-22MHz			-50	dBr
Frequency Error	-25	-1	+ 25	ppm
Constellation Error(peak EVM)@ target power				
1~11Mbps			35%	

RX Characteristics	Min.	Typical	Max.	Unit
Minimum Input Level Sensitivity				
1Mbps (FER≦8%)		-97	-83	dBm
2Mbps (FER≦8%)		-93	-80	dBm

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5.5Mbps (FER≦8%)		-91	-79	dBm
11Mbps (FER≦8%)		-89	-76	dBm
Maximum Input Level (FER≦8%)	-10			dBm

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3.8.3 IEEE802.11g mode

Item	Specification
Modulation Type	OFDM
Frequency range	2400MHz~2483.5MHz
Channel	CH1 to CH13
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps

TX Characteristics	Min.	Typical	Max.	Unit
Transmitter Output Power				
11gTarget Power	13	15	17	dBm
Spectrum Mask @ target power				
fc +/-11MHz			-20	dBr
fc +/-20MHz			-28	dBr
fc > +/-30MHz			-40	dBr
Frequency Error	-25	-1.1	+ 25	ppm
Constellation Error(peak EVM)@ target power				
6Mbps			-5	dBm
9Mbps			-8	dBm
12Mbps			-10	dBm
18Mbps			-13	dBm
24Mbps			-16	dBm
36Mbps			-19	dBm
48Mbps			-22	dBm
54Mbps		-30	-25	dBm

RX Characteristics	Min.	Typical	Max.	Unit
Minimum Input Level Sensitivity				
6Mbps (FER≦10%)		-90	-82	dBm
9Mbps (FER≦10%)		-88	-87	dBm
12Mbps (FER≦10%)		-86	-79	dBm
18Mbps (FER≦10%)		-85	-77	dBm
24Mbps (FER≦10%)		-82	-74	dBm
36Mbps (FER≦10%)		-79	-70	dBm
48Mbps (FER≦10%)		-75	-66	dBm
54Mbps (FER≦10%)		-72	-65	dBm

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RX Characteristics	Min.	Typical	Max.	Unit
Maximum Input Level (FER≦10%)	-20			dBm

3.8.4 IEEE802.11n 20MHz bandwidth mode

Item	Specification
Modulation Type	MIMO-OFDM
Channel	CH1 to CH13
Data rate	MCS0/1/2/3/4/5/6/7

TX Characteristics	Min.	Typical	Max.	Unit
Transmitter Output Power				
11n HT20Target Power	13	15	17	dBm
Spectrum Mask @ target power				
fc +/-11MHz			-20	dBr
fc +/-20MHz			-28	dBr
fc > +/-30MHz			-45	dBr
Frequency Error	-25	-1.2	+ 25	ppm
Constellation Error(peak EVM)@ target power				
MCS0			-5	dBm
MCS1			-10	dBm
MCS2			-13	dBm
MCS3			-16	dBm
MCS4			-19	dBm
MCS5			-22	dBm
MCS6			-25	dBm
MCS7		-32	-28	dBm

RX Characteristics	Min.	Typical	Max.	Unit
Minimum Input Level Sensitivity				
MCS0 (FER≦10%)		-89	-82	dBm
MCS1 (FER≦10%)		-86	-79	dBm
MCS2 (FER≦10%)		-84	-77	dBm
MCS3 (FER≦10%)		-82	-74	dBm
MCS4 (FER≦10%)		-78	-70	dBm
MCS5 (FER≦10%)		-74	-66	dBm

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RX Characteristics	Min.	Typical	Max.	Unit
MCS6 (FER≦10%)		-72	-65	dBm
MCS7 (FER≦10%)		-69	-64	dBm
Maximum Input Level (FER≦10%)	-20			dBm

3.8.5 IEEE802.11n 40MHz bandwidth mode

Item	Specification
Modulation Type	MIMO-OFDM
Channel	CH3 to CH11
Data rate	MCS0/1/2/3/4/5/6/7

TX Characteristics	Min.	Typical	Max.	Unit
Transmitter Output Power				
11n HT20Target Power	12	14	16	dBm
Spectrum Mask @ target power				
fc +/-22MHz			-20	dBr
fc +/-40MHz			-28	dBr
fc > +/-60MHz			-45	dBr
Frequency Error	-25	-1.3	+ 25	ppm
Constellation Error(peak EVM)@ target power				
MCS0			-5	dBm
MCS1			-10	dBm
MCS2			-13	dBm
MCS3			-16	dBm
MCS4			-19	dBm
MCS5			-22	dBm
MCS6			-25	dBm
MCS7		-31	-28	dBm

RX Characteristics	Min.	Typical	Max.	Unit
Minimum Input Level Sensitivity				
MCS0 (FER≦10%)		-87	-79	dBm
MCS1 (FER≦10%)		-84	-76	dBm
MCS2 (FER≦10%)		-81	-74	dBm
MCS3 (FER≦10%)		-79	-71	dBm

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RX Characteristics	Min.	Typical	Max.	Unit
MCS4 (FER≦10%)		-75	-67	dBm
MCS5 (FER≦10%)		-71	-63	dBm
MCS6 (FER≦10%)		-69	-62	dBm
MCS7 (FER≦10%)		-66	-61	dBm
Maximum Input Level (FER≦10%)	-20			dBm

3.9 Mechanical Dimensions

3.9.1 Mechanical Dimensions Of EMW3280 (Metric units)

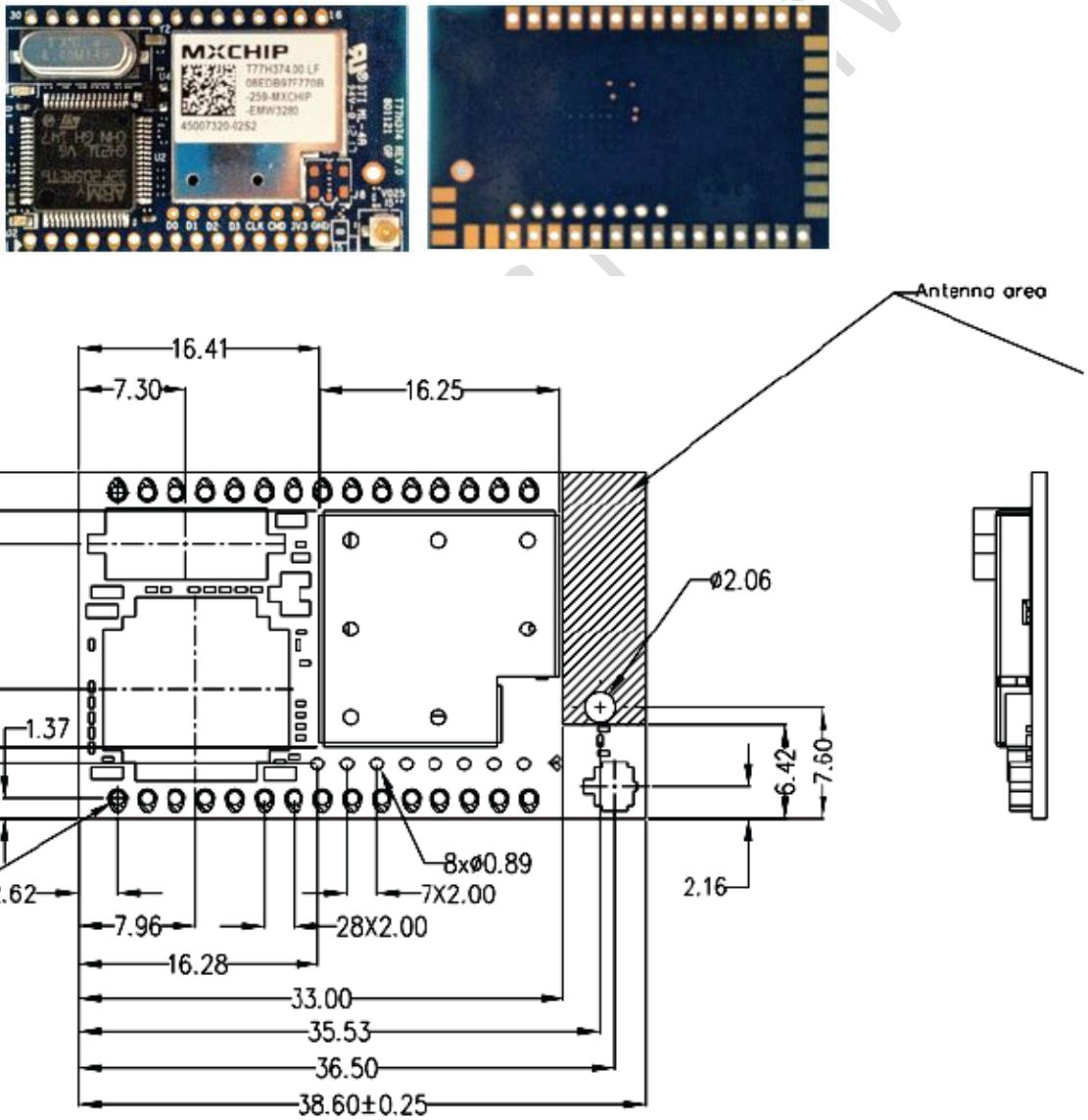

Figure 3.1 EMW3280 top view

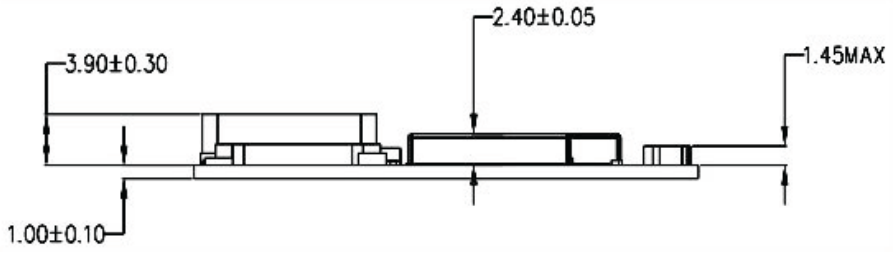

Figure 3.2 EMW3280 side view

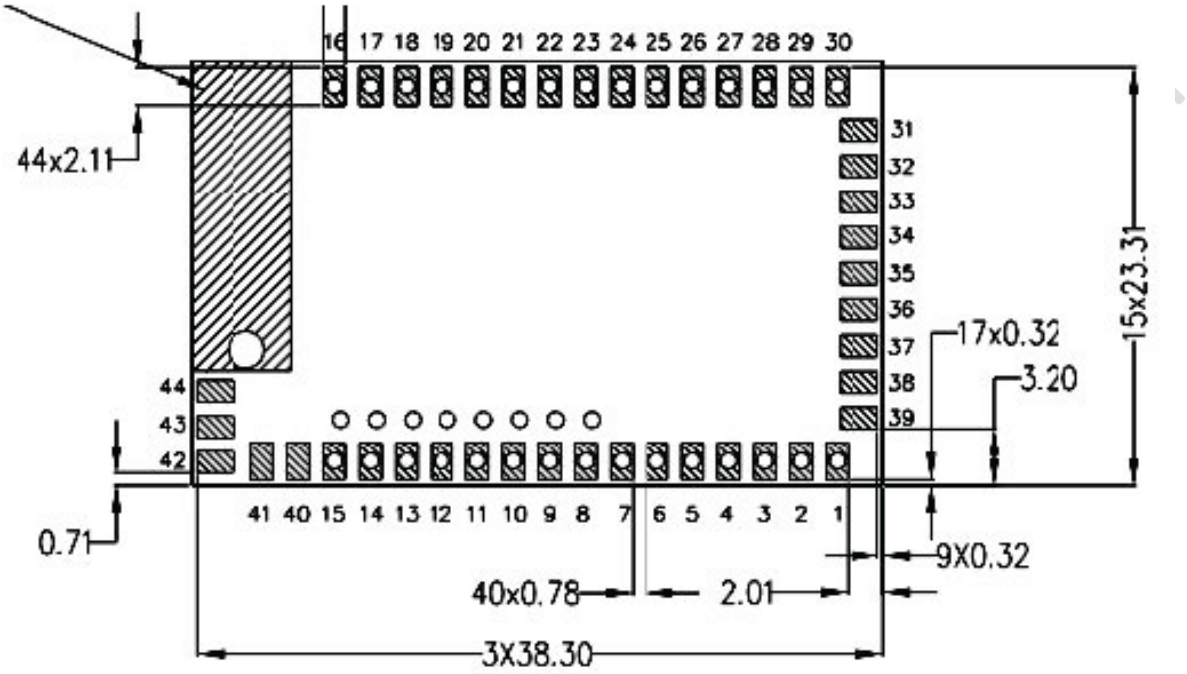

Figure 3.3 EMW3280 bottom view

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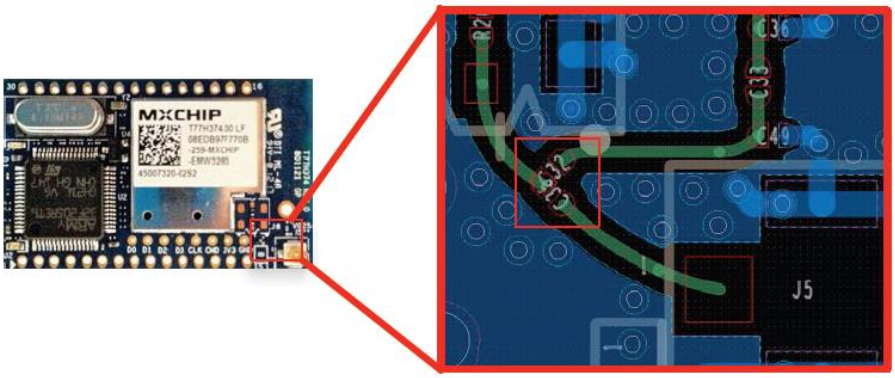
4 Antenna information

There is co-layout design (C35&C32) for antenna connection. Please order your module carefully. Users can also modify the capacitor position but MXCHIP would not take any responsibility for this behavior.

EMW3280-E load the capacitor C35 (10pF/0201), it means can use U.F.L RF connector for external antenna. If want to use on-board PCB printed antenna, just need load the capacitor from C35 to C32 (EMW3280-P).

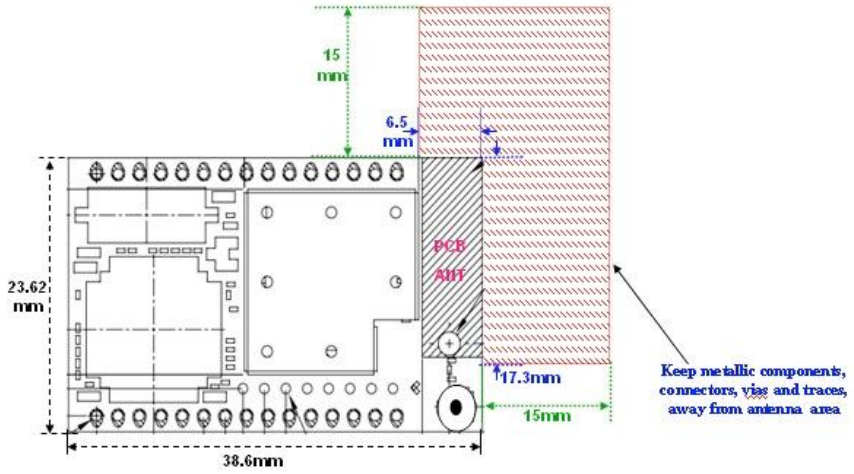
In order to get the maximum performance, strongly suggest customer use external antenna connected with U.F.L RF connector.



4.1 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 (6.5mmx17.3mm) 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.



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4.2 On-board Antenna Specification

Operating Frequency	2.412~2.472GHz
VSWR(max)	<=2.5:1
Peak Gain	~2.1dBi
Antenna Type	PCB printed PiFA antenna

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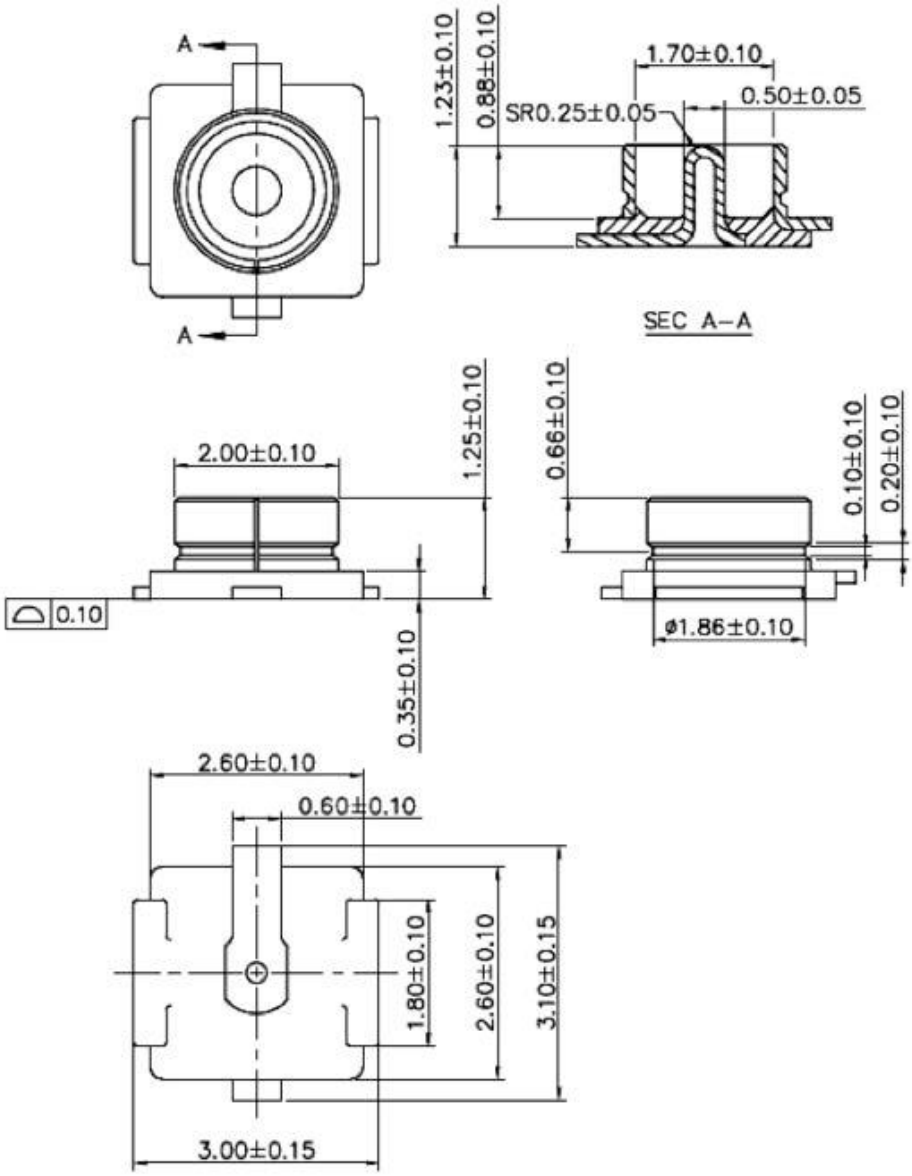
4.3 U.F.L RF Connector

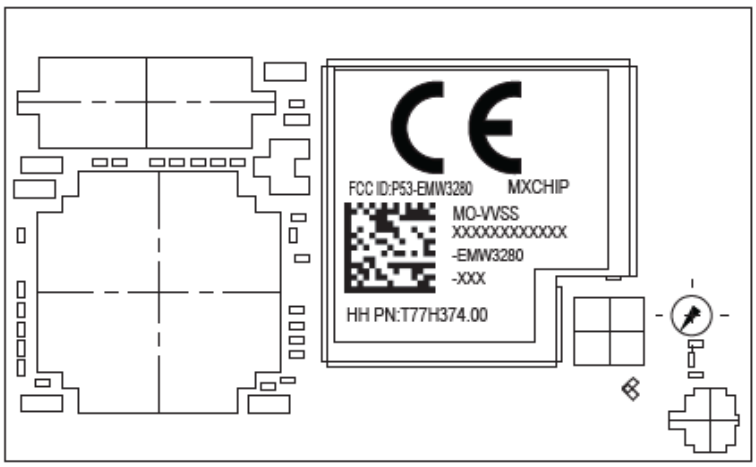
This module use U.F.L type RF connector for external antenna connection.



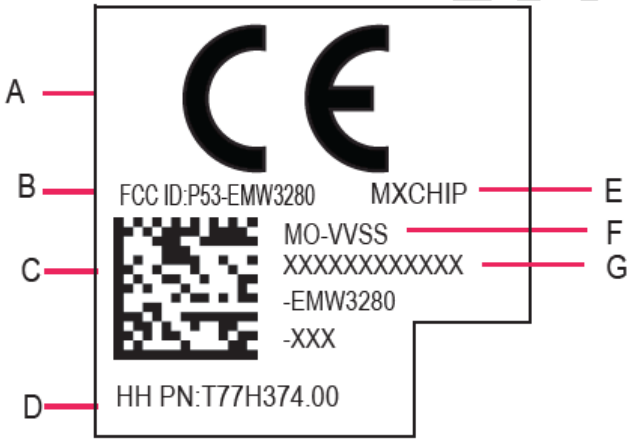
MXC Approved

5 Label

Labelposition：



Meaning of each tag on the label



A：CE logo

B：FCC ID

C：QR code，XXXXXXXXXXXX - EMW3280 - XXX，same as G

XXXXXXXXXXXX：MAC address

EMW3280：Model

XXX：Product data

D：Inside model

E：MXCHIP logo

F：Model on production line

G：QR code content

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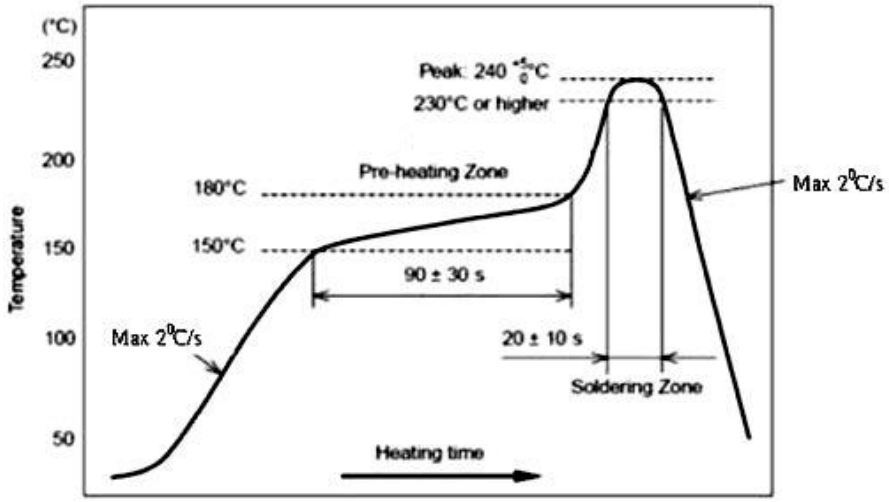
6 Recommended Reflow Profile

Reflow times<= 2times (Max.)



Temperature profile for evaluation of solder heat resistance of a component (at solder joint)

7 MSL/Storage Condition

8 Sales Information

If you need to buy this product, please call MXCHIP during the working hours. (Monday ~ Friday A.M.9:00~12:00; P.M. 1:00~6:00)

Telephone: +86-21-52655026 / 52655025

Address: Room 811, Tongpu Building, No.1220 Tongpu Road, Shanghai

Post Code: 200333

Email: sales@mxchip.com

9 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:

ST ARM technical support

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+86 (021)58655026-812 Email: support@mxchip.com

Development tools technical support

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