Data Sheet EMW3280

UART/Wi-Fi high speed data transceiver

2.0 Date: 2012-8-8 Data sheet

Overview

EMW3280 Wi-Fi modules developed by MXCHIP integrate the TCP/IP protocol, IEEE 802.11b/g MAC and PHY. Wireless network function can be deployed on user's products easily. EMW3280 will save your development time and greatly improve your product's competitiveness.

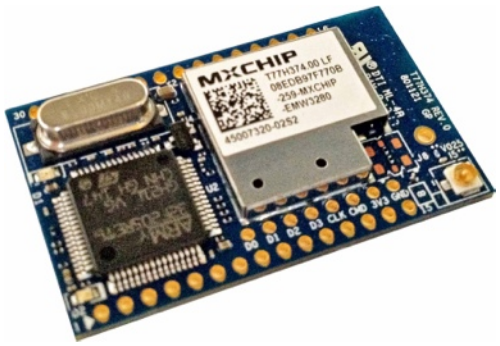
This product line is used to convert data between UART and WLAN and support all of the IEEE 802.11i security modes.

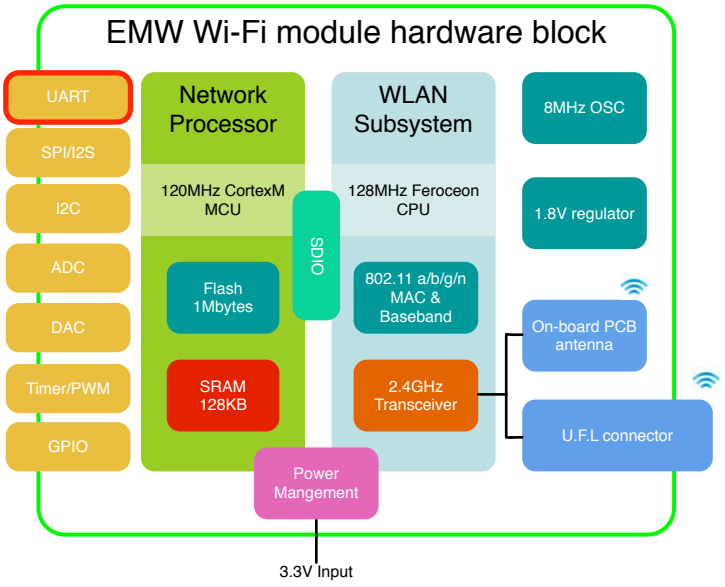
Applications

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

Products List

EMW		3		Generation		Function		Interface		-	Package	
EMW	Embedded Wi-Fi	3	Module	2	3rd(2012)	8	Full function	0	UART		2	2.0mm lead pitch pins
											4	2.0mm LGA





MXCHIP CORPORATION
Wireless M2M Division

Features

- Fast, ease of use embedded system interface

  - UART baudrate is up to 921600
  - Max. data transmission speed: 90kbytes/s (UART)
  - Support UART hardware flow control which ensure reliable data transmission in high speed mode
  - Simplified hardware connections

- Secure, stable Wi-Fi link

  - Support AP chient mode, soft AP mode and Ad-hoc mode
  - Secure, stable Wi-Fi link
  - Auto recover from Wi-Fi's disconnection
  - Support WPA/WPA2 PSK, WEP encryption
  - IPEX antenna connector, on board PCB antenna
  - CE，FCC passed

- Embedded TCP/IP stack

  - Support UDP protocol, broadcast and unicast
  - Support TCP protocol, act as TCP server or client
  - Allow 3 connections from TCP client under TCP server mode
  - Auto reconnect after TCP link is lost
  - Transfer data to internet through a gateway
  - Support DNS service

- Flexible configuration and management

  - Use EMSP commands to control and config module through UART
  - Send EMSP commands from Wi-Fi network
  - Configuration on build-in html pages
  - Configuration software is provided on multiple platforms

- Designed for embedded systems

  - Less than 220mA in running mode
  - Less than 1mA in standby mode
  - Less than 30mA in low power mode, network connection is maintained
  - Time interval from reset to Wi-Fi connection is less than 2 seconds

- Reliable quality, comprehensive technical services

  - Industrial temperature range: －40～80°C
  - Module test appliance is provided
  - ROSH certification passed
  - Evaluation boards, API library and test source codes are provided

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8. Technical Support

1. Function Description

EMW3280 Wi-Fi modules developed by MXCHIP integrate the TCP/IP protocol, IEEE 802.11b/g MAC and PHY. Wireless network function can be deployed on user's products easily. EMW3280 will save your development time and greatly improve your product's competitiveness.

EMW3280 modules can run in the industrial temperature rang: -40°C to 85°C. The highest baudrate of UART interface is 921600. It has two transfer modes: TCP, UDP, and support EMSP commands to configure its parameters.

1.1. Features

★ Single operation voltage: 3.3V.

★ Power consumption: <220mA under run mode, current <1mA under standby mode.

★ CPU frequency: 120MHz，flash size: 1M bytes，RAM size128k bytes.

★ Two working modes: command mode and data transmission mode.

★ Complete Wi-Fi wireless communications solutions, to reduce the resource requirements of the application processor;

★ Multipul configuration methods: build-in web pages，EMW tool box(PC software) and EMSP commands;

RF features

★ WLAN standard: IEEE 802.11b/g/n, Wi-Fi compatible.

★ RF frequency: 2.4G ISM.

★ Support AP chient mode, soft AP mode and Ad-hoc mode.

★ WEP40 and WEP104 encryption (64/128bit), support open system or shared key.

★ WPA/WPA2 PSK encryption, use AES or TKIP encryption algorithm.

★ Auto recover from Wi-Fi disconnection.

★ Time interval from reset to Wi-Fi connection is less than 2 seconds.

UART features

★ UART Baudrate：1200－921600;

★ Highest transmission speed: 90kbytes/s(send or receive), 60kbytes/s(send & receive both).

★ upport UART hardware flow control that provide the reliable data transmission

TCP/IP features

★ Support DNS service.

★ Support DHCP client and DHCP server.

★ Support network data transmission protocol: TCP, UDP;

★ TCP server or client.

★ Reliable TCP link management: Automatic reconnect when the connection was lost.

★ As a TCP server, allow 3 TCP connection from the clients.

★ UDP broadcast or unicast.

1.2. Electrical Parameters

1.2.1. 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 pin	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	

1.2.2. Operating conditions: Voltage & Current

Symbol	Note	Conditions	Specification			
			Min.	Typical	Max.	Unit
V_{DD}	Voltage		3.0	3.3	3.5	V
I_{VDD}	Current	VDD=3.3V, normal 2437 MHz，18 dBm， 11 Mbps CCK TX Speed：80kbytes/s	219	224	230	mA
I_{VDD}	Current	VDD=3.3V, normal 2437 MHz，18 dBm， 11 Mbps CCK TX Speed：10kbytes/s	199	202	204	mA
I_{VDD}	Current	VDD=3.3V, normal 2437 MHz，15 dBm， 54 Mbps OFDM TX Speed：80kbytes/s	203	204	205	mA
I_{VDD}	Current	VDD=3.3V, normal 2437 MHz，15 dBm， 54 Mbps OFDM TX Speed：10kbytes/s	199	200	202	mA
I_{VDD}	Current	VDD=3.3V，Receive mode	182	185	188	mA
I_{VDD}	Current	VDD=3.3V，Sleep mode		50	60	uA

1.2.3. Digital I/O port characteristics

Output voltage levels

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

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

NRST pin characteristics

The NRST 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.

Additional, you can also control the reset by means of the EMSP command.

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

1.2.4. Absolute maximum ratings: Temperature

Symbol	Ratings	Max	Unit
T_{STG}	Storage temperature	–55 to +125	°C
T_A	Working temperature	-40 to +85	°C

1.2.5. 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

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

1.2.6. 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

1.2.7. RF characteristics

Basic characteristics

Item	Specification
Operating Frequency	2.412~2.472GHz
WiFi 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)

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				
11b Target Power	16	18	< 25	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
5.5Mbps (FER≦8%)		-91	-79	dBm
11Mbps (FER≦8%)		-89	-76	dBm
Maximum Input Level (FER≦8%)	-10			dBm

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				
11g Target Power	13	15	< 25	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
Maximum Input Level (FER≦10%)	-20			dBm

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 HT20 Target Power	13	15	< 25	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
MCS6 (FER≦10%)		-72	-65	dBm
MCS7 (FER≦10%)		-69	-64	dBm
Maximum Input Level (FER≦10%)	-20			dBm

IEEE802.11n 40MHz bandwidth mode

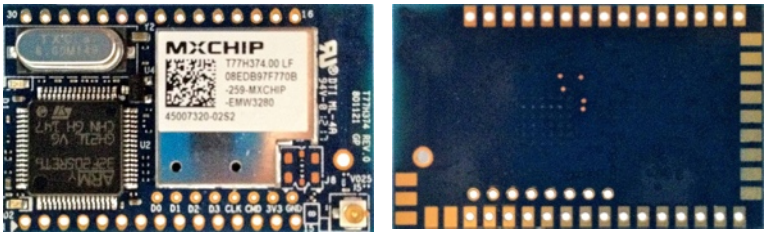
Item	Specification
Modulation Type	MIMO-OFDM
Channel	CH3 to CH11
Data rate	MCS0/1/2/3/4/5/6/7

TX Characteristics	Min.	Typical	Max.	Unit
Transmitter Output Power				
11n HT20 Target Power	12	14	< 25	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
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

1.3. Mechanical Dimensions

1.3.1. Mechanical Dimensions Of EMW3280 (Metric units)



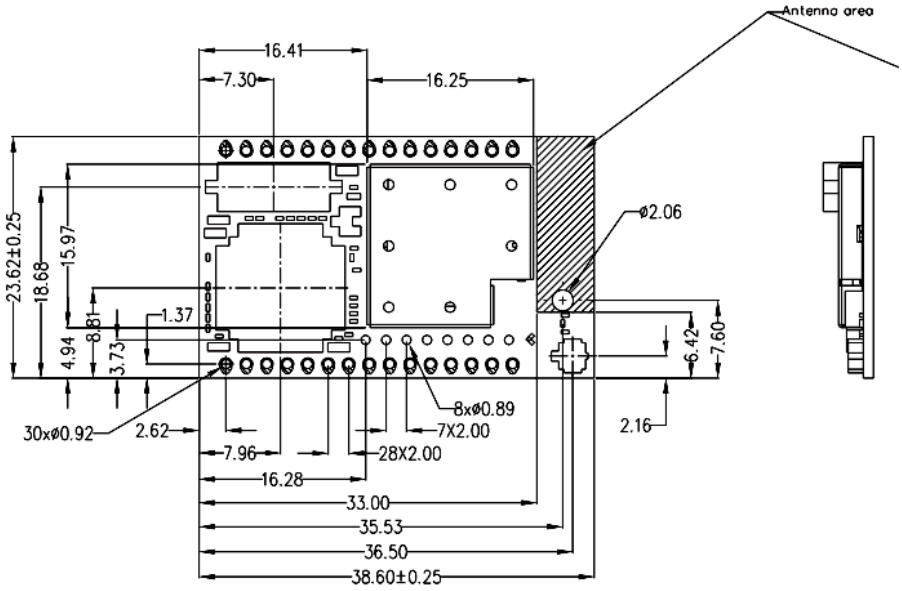


Figure 1.1 EMW3280 top view

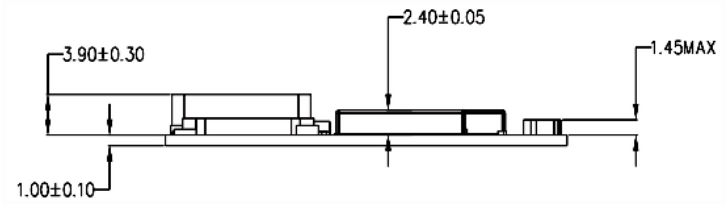


Figure 1.2 EMW3280 side view

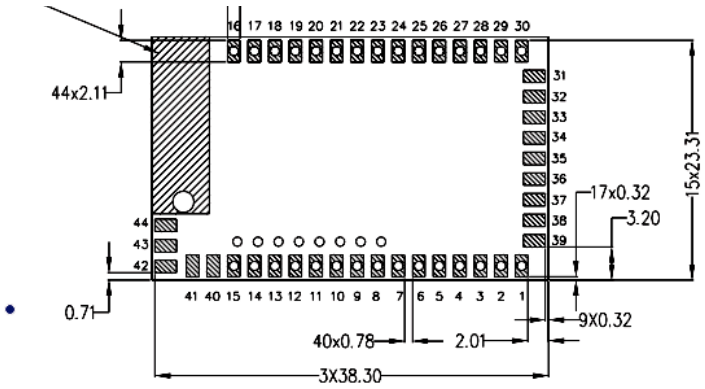


Figure 1.3 EMW3280 bottom view

2. Module interface

2.1. Leds

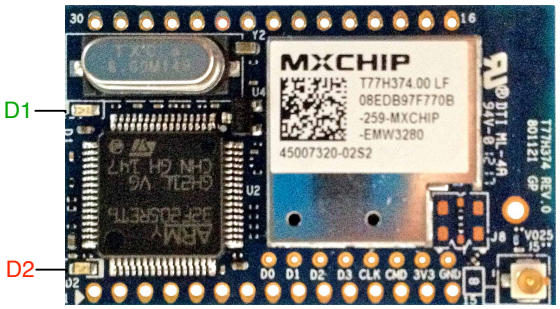


Table 2.1 LED functions

Name	Color	Description
D1	Green	On: Initialize successful, working in normal Off： Initialize failed, or standby mode Flashing (Short/short/short): Firmware update mode Flashing (Short/long/short): Illegal firmware version
D2	Red	Flashing: Data transmission (test failed in MFG mode) On： Wi-Fi is connected Off： Wi-Fi disconnected

2.2. Pinouts

EMW3280has 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.

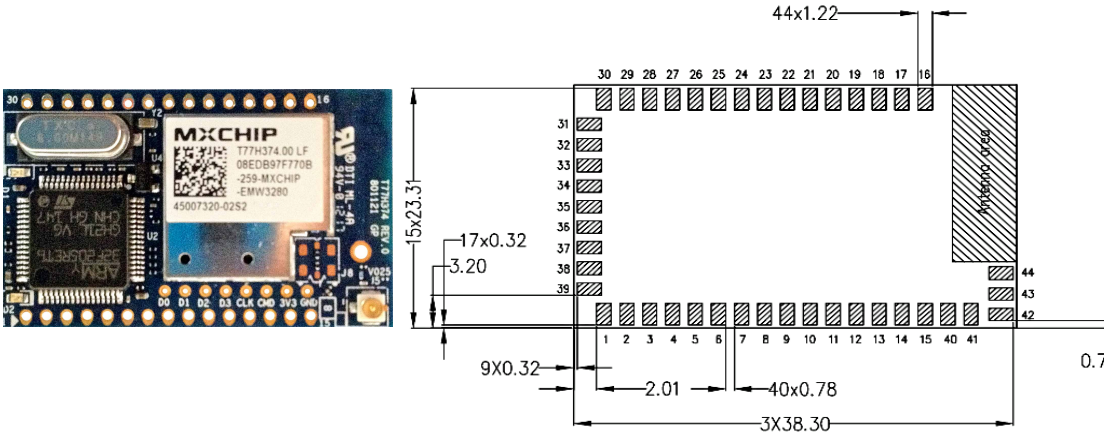


Figure2.1 EMW3280: appearance and pinout

2.3. Pin Arrangement

Figure 2.2 EMW3280 pin arrangement

Pins	Pin Name	FT	Pins	Pin Name	FT
1-14	NC		22	UART_TXD(OUT)	
15	GND		23	UART_RXD(IN)	√
16	nWI-FI LED(OUT) BOOT(IN)		24	VDD	
17	nRESET(IN)		25	GND	
18	IO1		26-28	NC	
19	NC		29	nWAKE_UP(IN)	
20	nUART_RTS(OUT)		30	STATUS(IN)	√
21	nUART_CTS(IN)	√			

2.4. Typical Hardware Connection And Pin Description

EMW3280 consume more power in data transmission. It is recommended that the VDD power supply is connected in parallel with a 330uF/5V solid capacitor, or a high-frequency electrolytic capacitor (low ESR), this can reduce the requirements of DC power supply, A 300mA LDO can be used (500mA LDO is recommended).

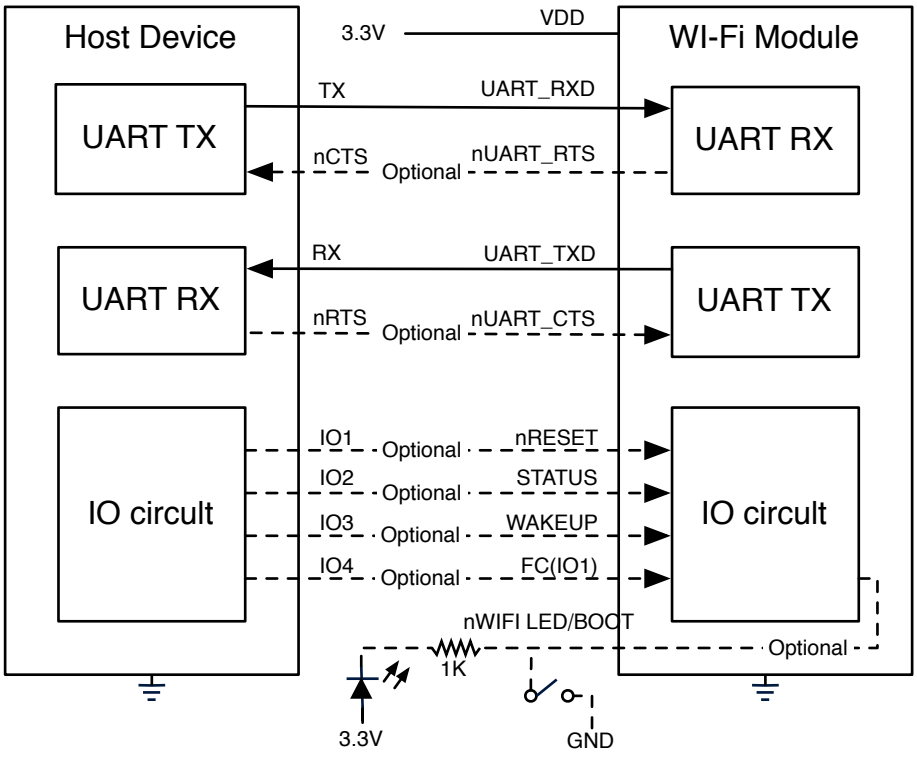


Figure 2.3 Typical hardware connection: TTL/CMOS UART Interface

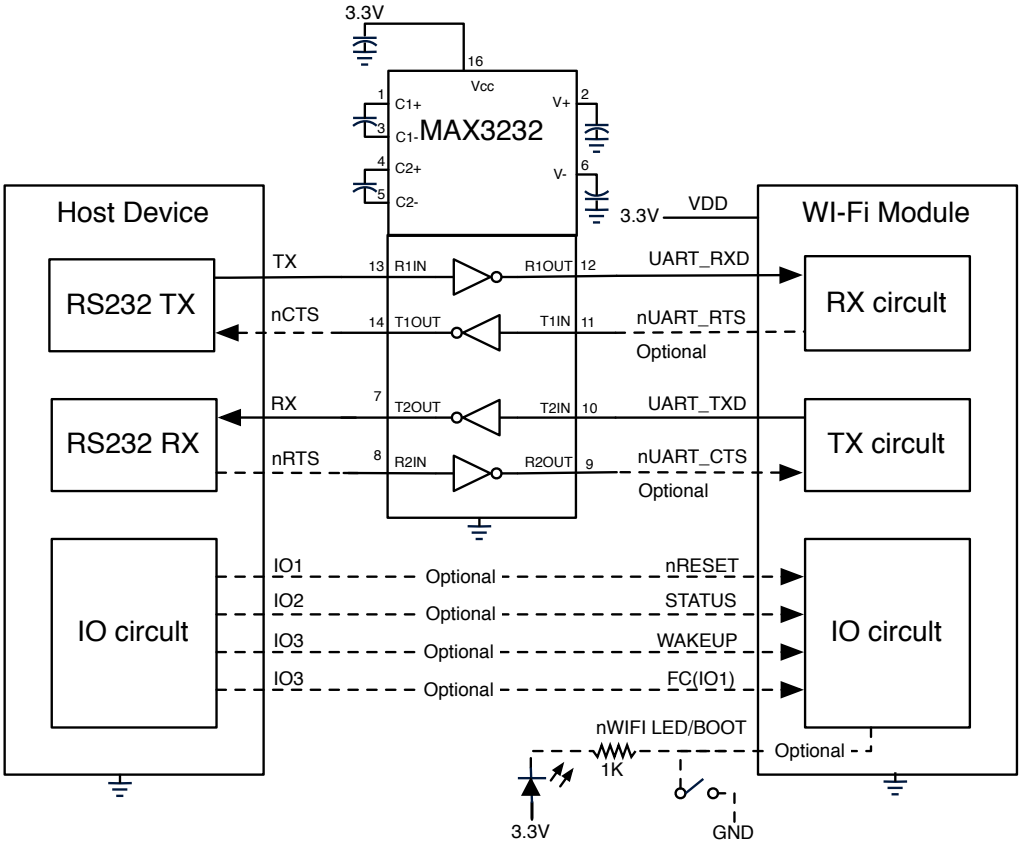


Figure 2.4 Typical hardware connection: RS232 UART Interface

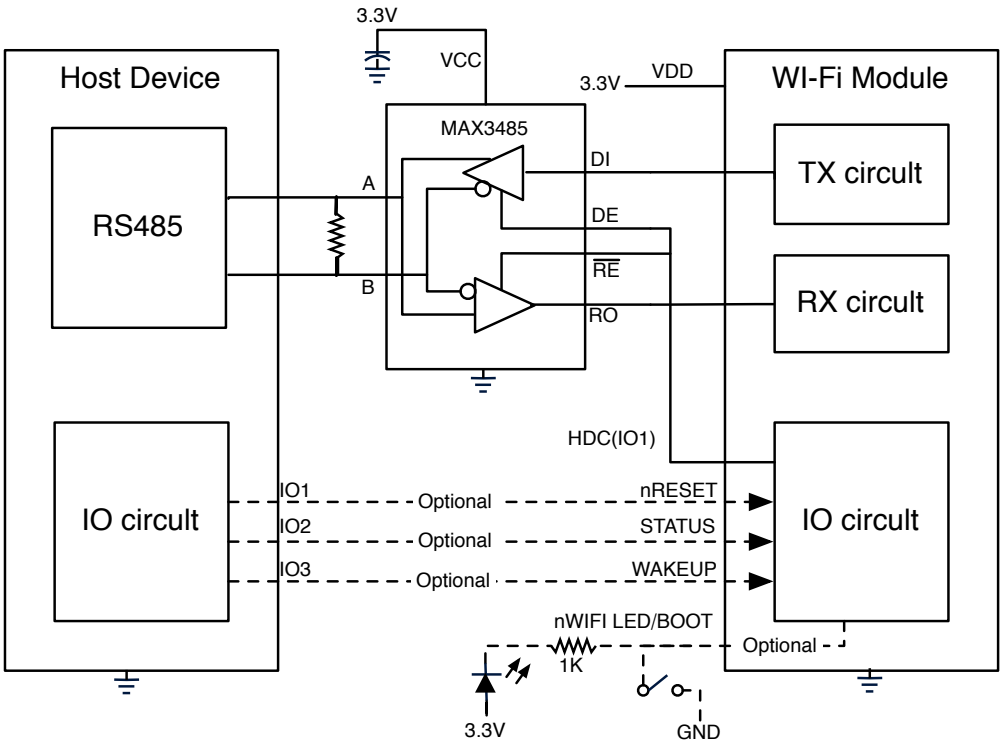


Figure 2.5 Typical hardware connection: RS485 UART Interface

Table 2.3 Pin functions

Pin	Type	Function
VDD		Power input.
GND		Grounding.
UART_RXD	I, FT	UART Data input.
UART_TXD	O	UART Data output.
nUART_CTS	I, FT	UART allow to send, active low.
nUART_RTS	O	UART is ready to receive, active low.
STATUS(IN)	I, FT, PU	Set the operation mode, cooperation with BOOT pin:
WAKE_UP(IN)	I, PU	• Pull down: Enter standby mode • Pull up: Wake up from standby mode
nRESET(IN)	I, PU	Pull down this pin for 1μs to reboot.
nWI-FI LED(OUT) BOOT(IN)	O/I, PU	This pin has two functions: nWIFI_LED：Output led D1 status, Low: D1 = on, High: D1 = off. BOOT：Enter different operation modes when powered on or reset.
IO1	NC	IO1 can be configured by software
	I	Set to Frame Control mode (FC), used in DTU mode: Input low, EMW3280 store the received UART data in RAM. Input high, EMW3280 send the buffed UART data over Wi-Fi network. Refer document: RM0001_EMW3280 for details
	O	Set to Half-duplex Control mode (HDC), used in DTU mode: Output low, while receiving UART data Output high, while sending UART data
NC		Undefined IOs. Leave them floating or grounding.

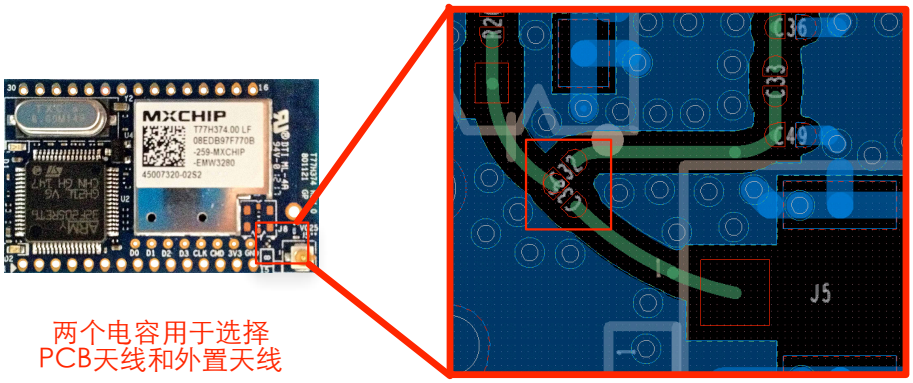
1. FT: = 5V input tolerant.
2. PU: The pin is at high level if no external signal is asserted.
3. PD: The pin is at low level if no external signal is asserted.
4. UART signals include: UART_TXD，UART_RXD，nUART_RTS和nUART_CTS.
5. Only VDD, GND UART_TXD and UART_RXD are needed in a simple connection.
6. We strong recommend that using STATUS signal to switch EMW3X80's operation mode.
7. nRESET should not be forced pulled up by external circuit, otherwise standby mode and internal watchdog would be unable to work properly. If an external signal is connected to nRESET, this signal must be Open Drain Mode (OD).
8. Use BOOT pin and STATUS pin to define different working mode.

BOOT	STATUS	EMW3280 operation mode
0	0	MFG mode
0	1 (Default)	FW UPDATE mode
1 (Default)	0	Command mode (working mode)
1 (Default)	1 (Default)	DTU mode (working mode)

3. Antenna

There is co-layout design (C35&C32) for antenna connection. Normally, 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.

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

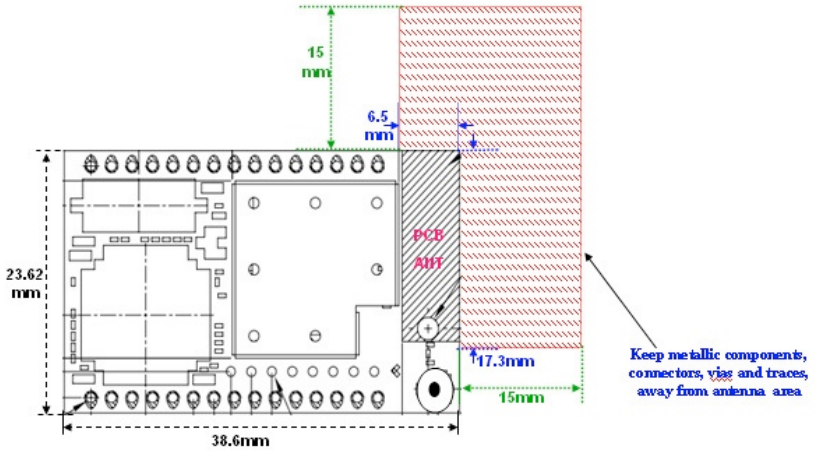


3.1. Minimizing radio interference

When integrating the WiFi 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.

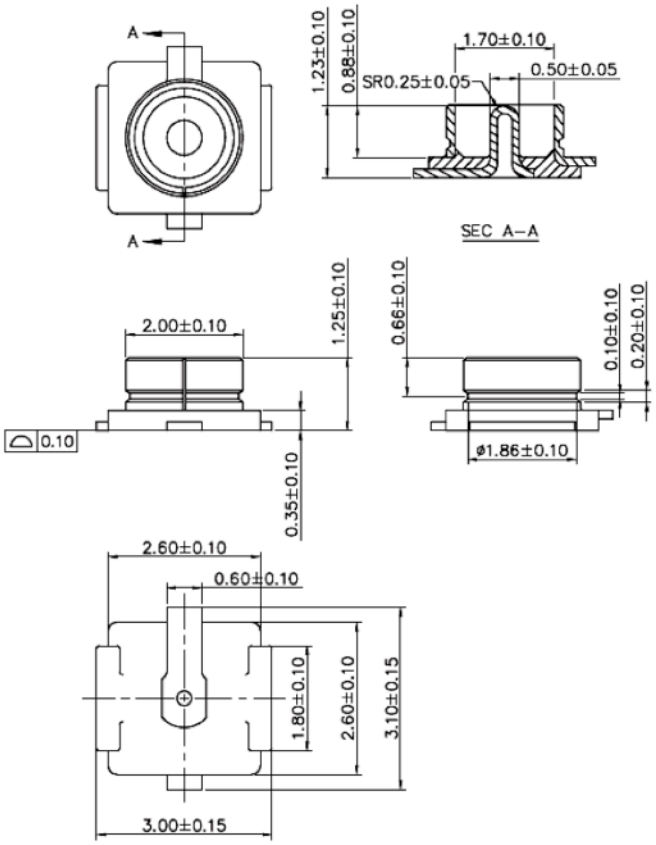


3.2. On-board Antenna Specification

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

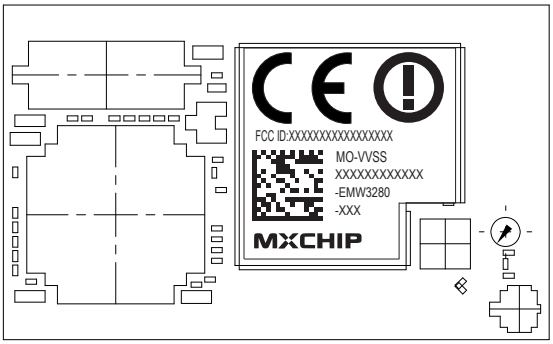
3.3. U.F.L RF Connector

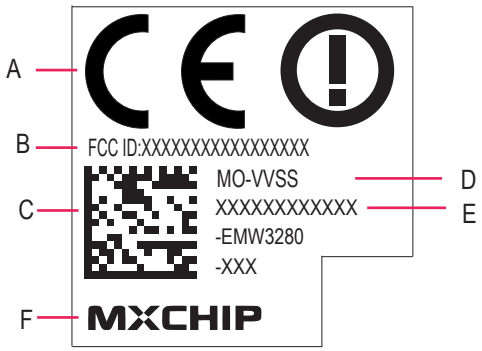
This module use U.F.L type RF connector for external antenna connection.



4. Lable

Label's position is as follow:





A: CE logo

B: FCC ID

C: Two-dimensional code，XXXXXXXXXXXX – EMW3280 – XXX，same mean as part E

D: Internal production mark

E: XXXXXXXXXXXX 12 digitals, EMW3280 MAC address

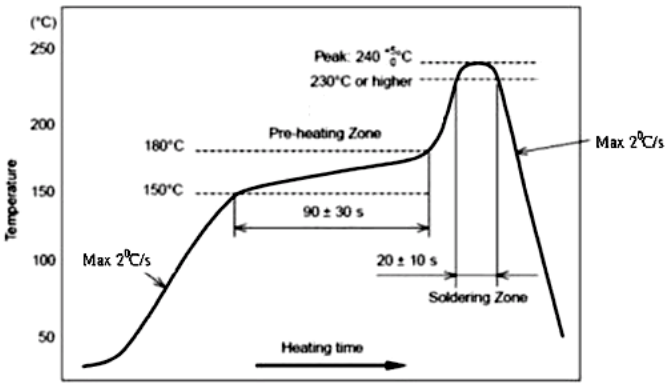
EMW3280: Model

XXX : Production date

F: MXCHIP logo

5. Recommended Reflow Profile

Reflow times<= 2times (Max.)



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

6. MSL/Storage Condition

7. Sales Information

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: Floor 2, Building No.9, Lane 271, Qianyang Street, Putuo District, Shanghai

Post Code: 200333

Email： sales@mxchip.com

8. Technical Support

To get technical support or other information, please visit

http://www.mxchip.com

To get telephone technical support, please call us during the working hours:

MCUs

+86 (021)52655026-822 Email： support@mxchip.com

Embedded wireless devices

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

Development tools

+86 (021) 52655026-822 Emali： support@mxchip.com

Information for the OEM Integrators
This device is intended for OEM integrators only. Please see the full grant of equipment document for restrictions.

Label Information to the End User by the OEM or Integrators
If the FCC ID of this module is not visible when it is installed inside another device, then the outside of the device into which the module is installed must be label with "Contains FCC ID: P53-EMW3280".

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.

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

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.

To satisfy FCC RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation.
To ensure compliance, operations at closer than this distance is not recommended.

Limited by local law regulations, version for North America does not have region selection option.