上海庆科信息技术有限公司
产品文档

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Data Sheet

EMW3165

Embedded Wi-Fi module

1.0 **Date : 2015-01-26** **Data Sheet**

Overview

Features

- Consists of a Cortex-M4 microcontroller and an IEEE 802.11™ b/g/n chip
  - Cortex-M4 core at 100MHz
  - 2M bytes on-board SPI flash and 512K bytes on-chip flash
  - 128K bytes RAM
- Operation voltage:3.0V~3.6V
- Peripherals
  - 22 GPIOs
  - JTAG/SWD debug interface
- Wi-Fi connectivity
  - 802.11b, 802.11g, 802.11n (single stream)
  - WEP, WPA/WPA2 PSK/Enterprise
  - 16.5dBm@11b, 14.5dBm@11g, 13.5dBm@11n
  - Receiver Sensitivity: -87 dBm
  - Station, Soft AP and Wi-Fi direct
  - Support EasyLink
  - On-board PCB antenna, IPEX connector for external antenna
  - CE, FCC compliant
- Operating Temperature: -30℃ to +85℃

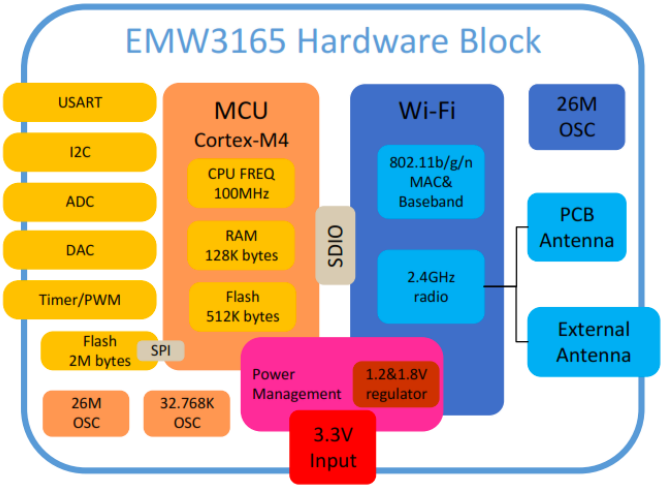
Applications

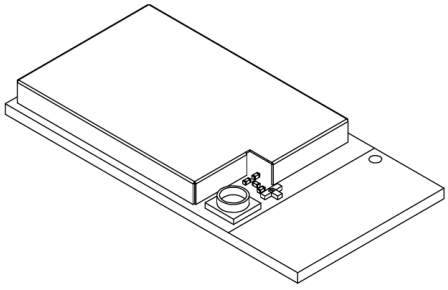
- Building Automation / Access Control
- Smart home appliances
- Medical/Health Care
- Industrial Automation Systems
- Point Of Sale system (POS)
- Auto electronics

Device summary

MXCHIP PN	Description	Note
EMW3165-P	PCB antenna	Default
EMW3165-E	External antenna	Optional

Hardware block





Contents

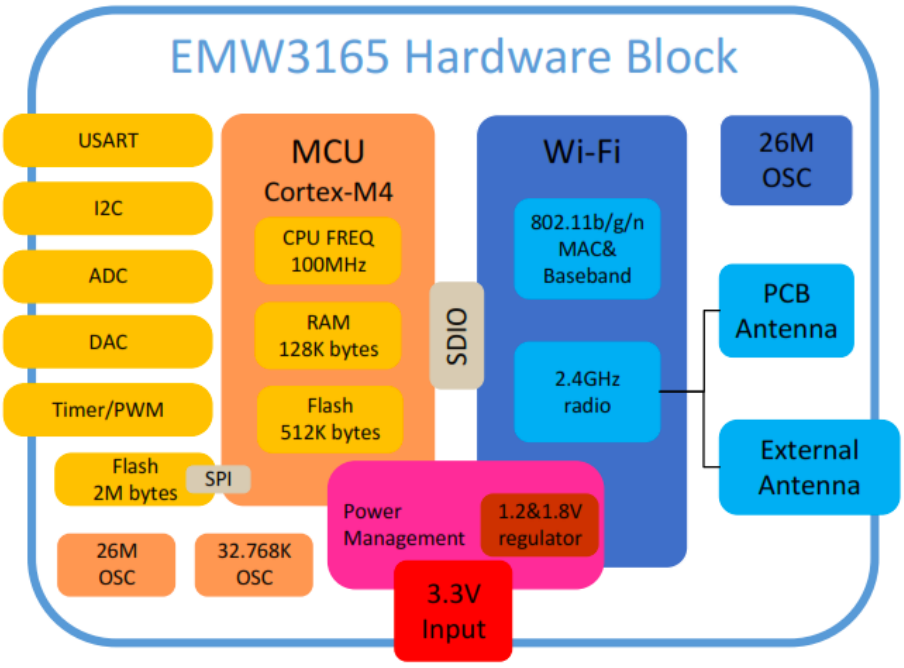
1 Introduction

EMW3165 is a low-power embedded Wi-Fi module integrates a wireless LAN MAC/baseband /radio, and a Cortex-M4 microcontroller STM32F411CE that runs a unique "self-hosted" Wi-Fi networking library and software application stack. EMW3165 has 2M bytes of on-board flash besides 512K bytes of in-chip flash, 128K bytes RAM and rich peripherals for user embedded Wi-Fi applications.

EMW3165 is also a MiCO™ platform, users can build their own embedded Wi-Fi applications based on MiCO™ library which manage all of the Wi-Fi MAC and TCP/IP stack processing. We also provide independent series of particular firmware to meet typical applications: Wireless UART, Cloud Service etc.

1.1 Block diagram

Figure 1.1 EMW3165 block diagram



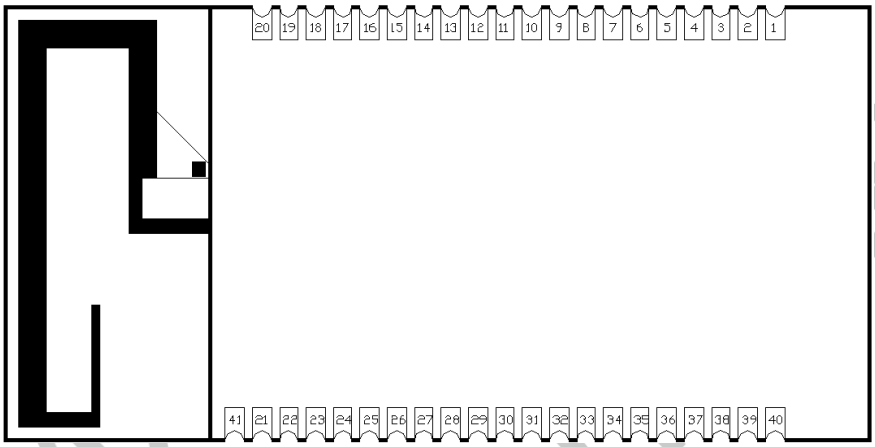
2 Interface

2.1 Pinouts

EMW3165 has two groups of pins (1X20 +1X21). The lead pitch is 1mm.

EMW3165 has half-hole footprint fit for hand-soldering.

Figure 2.1 EMW3165 pinout



2.2 General Pin Arrangement

Important Note: If developer build an application based on MICO system, they can define or modify the function for every pin on EMW3165. The possible functions on every pin are listed in Table 2.1.

But if developer download a pre-build firmware provided by MXCHIP, the function for every EMW3165 pin are defined by this firmware and described in the User Manual of this firmware. Take UART<=>Wi-Fi firmware for example, developer should achieve the specific pin definition from RM0001E_mxchipWNet_DTU available on:

http://www.joinmx.com/uploadfiles/soft/EMW/RM0001E_mxchipWNet_DTU_V4_1.pdf

Table 2.1 EMW3165 general pin arrangement

Pins	Name	Type	IO level	Function
1	-	-	-	Not connected
2	PB2	I/O	FT	BOOT1
3	-	-	-	Not connected
4	PA7	I/O	FT	Flash_SPI1_MOSI
5	PA15	I/O	FT	Flash_SPI1_NSS
6	PB3	I/O	FT	Flash_SPI1_SCK
7	PB4	I/O	FT	Flash_SPI1_MISO
8	PA2	I/O	FT	TIM2_CH3,TIM5_CH3,TIM9_CH1, I2S2_CKIN,USART2_TX, ADC1_2
9	PA1	I/O	FT	TIM2_CH2,TIM5_CH2,SPI4_MOSI/I2S4_SD, USART2_RTS, ADC1_1
10	VBAT	S	-	-
11	-	-	-	Not connected
12	PA3	I/O	FT	TIM2_CH4,TIM5_CH4,TIM9_CH2, I2S2_MCK,USART2_RX, ADC1_3
13	NRST	I/O	FT	RESET
14	PA0	I	TC	Wi-Fi wake up MCU
15	-	-	-	Not connected
16	PC13	I/O	FT	RTC_AMP1, RTC_OUT, RTC_TS
17	PB10	I/O	FT	TIM2_CH3,I2C2_SCL, SPI2_SCK/I2S2_CK,I2S3_MCK
18	PB9	I/O	FT	TIM4_CH4,TIM11_CH1,I2C1_SDA, SPI2_NSS/I2S2_WS,I2C2_SDA
19	PB12	I/O	FT	TIM1_BKIN,I2C2_SMBA,SPI2_NSS/I2S2_WS, SPI4_NSS/I2S4_WS,SPI3_SCK/I2S3_CK
20	GND	S	-	-
21	GND	S	-	-
22	-	-	-	Not connected
23	-	-	-	Not connected
24	-	-	-	Not connected
25	PA14	I/O	FT	SWD_SWCLK
26	PA13	I/O	FT	SWD_SWDIO
27	PA12	I/O	FT	TIM1_ETR,SPI5_MISO,USART1_RTS, USART6_RX,USB_FS_DP
28	-	-	-	Not connected
29	PA10	I/O	FT	TIM1_CH3,SPI5_MOSI/I2S5_SD, USART1_RX,USB_FS_ID
30	PB6	I/O	FT	TIM4_CH1,I2C1_SCL,USART1_TX
31	PB8	I/O	FT	TIM4_CH3,TIM10_CH1,I2C1_SCL,

Pins	Name	Type	IO level	Function
				SPI5_MOSI/I2S5_SD,I2C3_SDA
32	-	-	-	Not connected
33	PB13	I/O	FT	TIM1_CH1N,SPI2_SCK/I2S2_CK, SPI4_SCK/I2S4_CK,
34	PA5	I/O	TC	TIM2_CH1/TIM2_ET, SPI1_SCK/I2S1_CK,ADC1_5
35	PA11	I/O	FT	TIM1_CH4,SPI4_MISO,USART1_CTS, USART6_TX,USB_FS_DM
36	PB1	I/O	FT	TIM1_CH3N,TIM3_CH4, SPI5_NSS/I2S5_WS,ADC1_9
37	PB0	I/O	FT	TIM1_CH2N,TIM3_CH3, SPI5_SCK/I2S5_CK,ADC1_8
38	PA4	I/O	TC	SPI1_NSS/I2S1_WS,SPI3_NSS/I2S3_WS, USART2_CK,ADC1_4
39	VDD	S	-	-
40	VDD	S	-	-
41	ANT	-	-	External Antenna Pad

1. S = Supply pin. I = Input only pin. I/O = Input/output pin.
2. FT = 5 V tolerant I/O; TC = Standard 3.6 V I/O.
3. Pin4~7 should not be used as other functions since they have been used as SPI1 for on-board flash.
4. Use SWD (Pin 25&26) instead of JTAG to debug/download firmware.
5. Please refer to STM32F411xE datasheet about alternate function mapping.

3 Electrical Parameters

3.1 Operating conditions

EMW3165 enters an unstable condition whenever the input voltage dips below the minimum value of supply voltage. This condition must be considered during design of the power supply routing, especially if operating from a battery.

High-current operations (such as a TX packet) cause a dip in the supply voltage, potentially triggering a brownout. The resistance includes the internal resistance of the battery, contact resistance of the battery holder (4contacts for a 2 x AA battery) and the wiring and PCB routing resistance.

For example, the device draws about 320 mA from the supply @ 3.3 V for a 1 DSSS packet at maximum power. This condition can cause a drop of 160 mV across a 0.5-Ω routing resistance.

Table 3.1 Voltage conditions

Symbol	Note	Conditions	Specification			
			Min.	Typical	Max.	Unit
V_{DD}	Voltage		3.0	3.3	3.6	V

Table 3.2 Current characteristics

Symbol	Ratings	Max	Unit
I_{VDD}	Total current into VDD power lines	320	mA
I_{IO}	Output current sunk by any I/O and control pin	25	
	Output current source by any I/O and control pin	-25	

3.2 Absolute maximum ratings

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.

Table 3.3 Absolute maximum ratings

Symbol	Ratings	Min	Max	Unit
V_{DD}	Voltage	–0.3	4.0	V
V_{IN}	Input voltage on 5 V tolerant pin	−0.3	5.5	V
V_{IN}	Input voltage on any other pin	−0.3	V_{DD}+0.3	V

3.3 Current consumption

3.3.1 Wi-Fi Subsystem

Table 3.4 Current consumption of Wi-Fi subsystem

Symbol	Note	Conditions	Typical	Unit
I_{RF}	OFF[1]	-	2	μA
I_{RF}	SLEEP[4]	-	200	μA
I_{RF}	Rx(Listen)[2]	-	52	mA
I_{RF}	Rx(Active)[3]	-	59	mA
I_{RF}	Power Save[5 6]	-	1.9	mA
I_{RF}	Tx CCK[7 10]	11 Mbps at 18.5 dBm	320	mA
I_{RF}	Tx OFDM[8 10]	54 Mbps at 15.5 dBm	270	mA
I_{RF}	Tx OFDM[9 10]	65 Mbps at 14.5 dBm	260	mA

Note 1: Power is off.

Note 2: Carrier Sense (CCA) when no carrier present

Note 3: Carrier Sense (CS) detect/Packet Rx

Note 4: Intra-beacon Sleep

Note 5: Beacon Interval = 102.4ms, DTIM = 1, Beacon duration = 1 ms @1 Mbps.

Integrated Sleep + wakeup + Beacon Rx current over 1 DTIM interval.

Note 6: In WLAN power-saving mode, the following blocks are powered down: Crystal oscillator, Baseband PLL, AFE, RF PLL, Radio

Note 7: CCK power at chip port. Duty cycle is 100%. Includes PA contribution.

Note 8: OFDM power at chip port. Duty cycle is 100%. Includes PA contribution.

Note 9: OFDM power at chip port is 16 dBm, duty cycle is 100%, includes PA contribution.

Note 10: Absolute junction temperature limits maintained through active thermal monitoring and dynamic TX duty cycle limiting.

3.3.2 Microcontroller Subsystem

Typical and maximum current consumption in **Run mode**, code with data processing running from Flash memory (ART accelerator enabled) or RAM

Table 3.5 Typical and maximum current consumption of MCU in Run mode

Symbol	Conditions	f_{HCLK}(MHz)	T_A=25°C		Unit
			Typ	Max	
I_{MCU}	External clock, all peripherals enabled	100	21.0	23.3	mA
		84	17.0	19.2	
		64	12.0	13.2	
		50	9.5	10.4	
		20	4.5	5.8	
	External clock, all peripherals disabled	100	12.0	14.6	
		84	10.0	11.9	
		64	7.0	8.4	
		50	5.5	6.6	
		20	2.5	3.7	

Typical and maximum current consumptions in **Stop mode**

Table 3.6 Typical and maximum current consumption of MCU in Stop mode

Symbol	Conditions	Parameter	T_A=25°C		Unit
			Typ	Max	
I_{MCU}	Flash in Stop mode, all oscillators OFF, no independent watchdog	Main regulator usage	114	145	uA
		Low power regulator usage	43	68	
	Flash in Deep power down mode, all oscillators OFF, no independent watchdog	Main regulator usage	76	105	
		Low power regulator usage	14	38	
		Low power low voltage regulator usage	10	30	

Typical and maximum current consumptions in **Standby mode**

Table 3.7 Typical and maximum current consumption of MCU in Standby mode

Symbol	Conditions	Parameter	Typ	Unit
			T_A=25°C	
I_{MCU}	Supply current in Standby mode	Low-speed oscillator (LSE) and RTC ON	3.0	μA
		RTC and LSE OFF	2.1	

3.3.3 Power consumption in typical operation modes[3]

Table 3.8 Current consumption of EMW3165 in typical operation modes

Symbol	Parameter	Conditions	Min	Average	Max	Unit
			T_A=25°C	T_A=25°C	T_A=25°C	
I_{module}	Total power consumption on EMW3165 module	No Wi-Fi data is transmitting[1]	2.8	7.2	75	mA
		Receive data in UDP mode, 20k bps[1]	2.8	12	262	mA
		Send data in UDP mode, 20k bps[1]	3	24	280	mA
		RF off, MCU enter standby mode[2]	4	6	8	μA
		Connecting to AP	52	74	340	mA

Note1: TA=25°C, MCU frequency=100MHz, with data processing running from Flash memory (ART accelerator enabled). Firmware process TCP/IP stack and IEEE 802.11 MAC every 250 ms, enter stop mode when no task is pending.

Wi-Fi subsystem is connected to an access point and run under power save mode in IEEE 802.11n@14.5 dBm TX power. AP Beacon Interval = 100ms, DTIM = 1.

Note2: Wi-Fi connection is disconnected.

Note3: These data may not be the same depend on different firmware functions.

3.4 I/O port characteristics

3.4.1 I/O static characteristics

Table 3.9 GPIO static characteristics

Symbol	Parameter		Conditions	Min	Typ	Max	Unit
V_{IL}	FT and NRST I/O input low level voltage		1.7V ≤V_{DD}≤ 3.6V	-	-	0.3V_{DD}	V
	BOOT0 I/O input low level voltage			-	-	0.1V_{DD}+0.1	
V_{IH}	FT and NRST I/O input low level voltage		1.7V ≤V_{DD}≤ 3.6V	0.7V_{DD}	-	-	V
	BOOT0 I/O input low level voltage			0.17V_{DD}+0.7	-	-	
V_{HYS}	FT and NRST I/O input hysteresis		1.7V ≤V_{DD}≤ 3.6V	0.1V_{DD}	-	-	V
	BOOT0 I/O input hysteresis			0.1	-	-	
R_{PU}	Weak pull-up equivalent resistor	All pins except for PA10	V_{IN}=V_{SS}	30	40	50	kΩ
		PA10		7	10	14	

R_{PD}	Weak pull-down equivalent resistor	All pins except for PA10	$V_{IN}=V_{DD}$	30	40	50	kΩ
		PA10		7	10	14	
C_{IO}	I/O pin capacitance		-	-	5	-	pF

3.4.2 RESET pin characteristics

The RESET pin input driver uses CMOS technology. It is connected to a permanent pull-up resistor, R_{PU}. EMW3165 contains RC (resistance-capacitance) reset circuit which ensures the module reset accurately when it powers up. If user need to reset manually, just connect the external control signals to the reset pins directly, but the control signal should be Open Drain Mode。

Table 3.10 Reset pin characteristics

Symbol	Parameter	Conditions	Min.	Typical	Max.	Unit
$V_{F(NRST)}$	NRST Input filtered pulse	-	–0.5	-	0.8	V
$V_{NF(NRST)}$	NRST Input not filtered pulse	-	2	-	VDD+0.5	
R_{PU}	Resistor for Pulling up	$V_{IN}= V_{SS}$	30	40	50	kΩ
T_{NRST_OUT}	Generated reset pulse duration	Internal Reset source	20	-	-	us

3.5 Temperature and Humidity

Table 3.11 Temperature and humidity

Symbol	Ratings	Max	Unit
T_{STG}	Storage temperature	-40 to +85	℃
T_A	Working temperature	-30 to +85	℃
Humidity	Non condensing, relative humidity	95%	-

3.6 ESD

The Electromagnetic Environment Electrostatic discharge

Table 3.12 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
V_{ESD}(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.

Table 3.13 Static latch-up

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

3.8 Other MCU electrical parameters

Please refer to STM32F411xE datasheet for more information.

4 RF characteristics

4.1 Basic RF characteristics

Table 4.1 RF Specification

Item	Specification
Operating Frequency	2.412~2.484GHz
Wi-Fi Standard	802.11b/g/n(single stream n)
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 72Mbps
Antenna type	PCB printed ANT U.F.L connector for external antenna (Optional)

4.2 IEEE802.11b mode

Table 4.2 IEEE802.11b mode specification

Item	Specification
Modulation Type	DSSS / CCK
Frequency range	2400MHz~2484MHz
Channel	CH1 to CH14
Data rate	1, 2, 5.5, 11Mbps

Table 4.3 IEEE802.11b mode TX characteristics

TX Characteristics	Min.	Test Data	Max.	Unit
Transmitter Output Power				
11bTarget Power	13.5	16.2	16.5	dBm
Spectrum Mask @ target power				
fc +/-11MHz to +/-22MHz	-	-41.73	-30	dBr
fc > +/-22MHz	-	-51.89	-50	dBr
Frequency Error	-20	3.9	+ 20	ppm
Constellation Error(peak EVM)@ target power				
1~11Mbps	-	-25.52	-9	dB

Table 4.4 IEEE802.11b mode RX characteristics

RX Characteristics	Min.	Test data	Max.	Unit
Minimum Input Level Sensitivity				
1Mbps (FER≦8%)	-	-87	-83	dBm
2Mbps (FER≦8%)	-	-85	-80	dBm
5.5Mbps (FER≦8%)	-	-83	-79	dBm
11Mbps (FER≦8%)	-	-80	-76	dBm

4.3 **IEEE802.11g mode**

Table 4.5 IEEE802.11g mode specification

Item	Specification
Modulation Type	OFDM
Frequency range	2400MHz~2484MHz
Channel	CH1 to CH14
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps

Table 4.6 IEEE802.11g mode TX characteristics

TX Characteristics	Min.	Test data	Max.	Unit
Transmitter Output Power				
11gTarget Power	11.5	14.16	14.5	dBm
Spectrum Mask @ target power				
fc +/-11MHz	-	-31.61	-20	dBr
fc +/-20MHz	-	-40.73	-28	dBr
fc > +/-30MHz	-	-43.54	-40	dBr
Frequency Error	-20	3.9	+ 20	ppm
Constellation Error(peak EVM)@ target power				
54Mbps		-28.52	-25	dB

Table 4.7 IEEE802.11g mode RX characteristics

RX Characteristics	Min.	Test data	Max.	Unit
Minimum Input Level Sensitivity				
6Mbps (FER≦10%)	-	-87	-82	dBm
9Mbps (FER≦10%)	-	-85	-80	dBm
12Mbps (FER≦10%)	-	-84	-79	dBm
18Mbps (FER≦10%)	-	-82	-77	dBm
24Mbps (FER≦10%)	-	-80	-74	dBm

RX Characteristics	Min.	Test data	Max.	Unit
36Mbps (FER≦10%)	-	-79	-70	dBm
48Mbps (FER≦10%)	-	-77	-66	dBm
54Mbps (FER≦10%)	-	-75	-65	dBm

4.4 **IEEE802.11n 20MHz bandwidth mode**

Table 4.8 IEEE802.11n mode specification

Item	Specification
Modulation Type	MIMO-OFDM
Channel	CH1 to CH14
Data rate	MCS0/1/2/3/4/5/6/7

Table 4.9 IEEE802.11n mode TX characteristics

TX Characteristics	Min.	Test data	Max.	Unit
Transmitter Output Power				
11n HT20 Target Power	10.5	13.43	13.5	dBm
Spectrum Mask @ target power				
fc +/-11MHz	-	-30.23	-20	dBr
fc +/-20MHz	-	-38.48	-28	dBr
fc > +/-30MHz	-	-44.8	-40	dBr
Frequency Error	-20	3.9	+ 20	ppm
Constellation Error(peak EVM)@ target power				
MCS7	-	-28.59	-28	dB

Table 4.10 IEEE802.11n mode RX characteristics

RX Characteristics	Min.	Test data	Max.	Unit
Minimum Input Level Sensitivity				
MCS0 (FER≦10%)	-	-85	-82	dBm
MCS1 (FER≦10%)	-	-83	-79	dBm
MCS2 (FER≦10%)	-	-82	-77	dBm
MCS3 (FER≦10%)	-	-80	-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

5 Antenna Information

5.1 Type of antenna

There are three types of antenna include PCB antenna, external antenna and antenna pad. The default type is PCB antenna. Users can modify the antenna type with the method below but MXCHIP would not take any responsibility for this behavior.

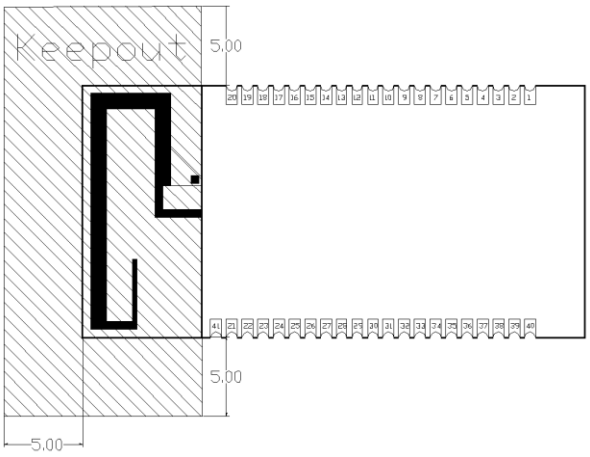
EMW3165 loads the resistance (0Ω/0402) in the red box, it means user can use PCB antenna. If user want to use U.F.L RF connector for external antenna, just need switch the resistance from red box to blue box and solder an U.F.L RF connector. If user switch the resistance from red box to yellow box, user can use antenna pad (pin 41).

Figure 5.1 Type of antenna

5.2 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 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.

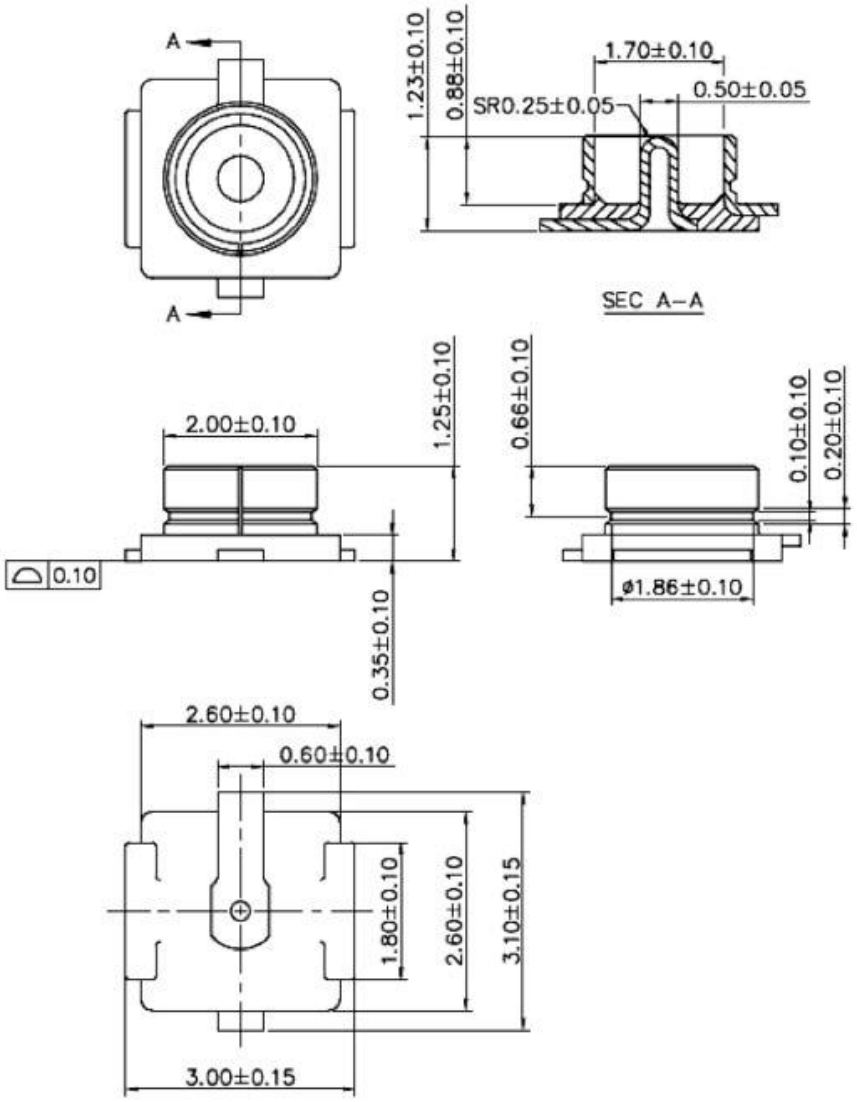
Figure 5.2 Minimum size of keep-out zone around antenna



5.3 **U.F.L RF Connector**

EMW3165 use U.F.L type RF connector for external antenna connection.

Figure 5.3 Mechanical dimensions of U.F.L RF connector



6 Manufactory Information

6.1 Mechanical Dimensions

Figure 6.1 EMW3165 top view(Unit: mm)

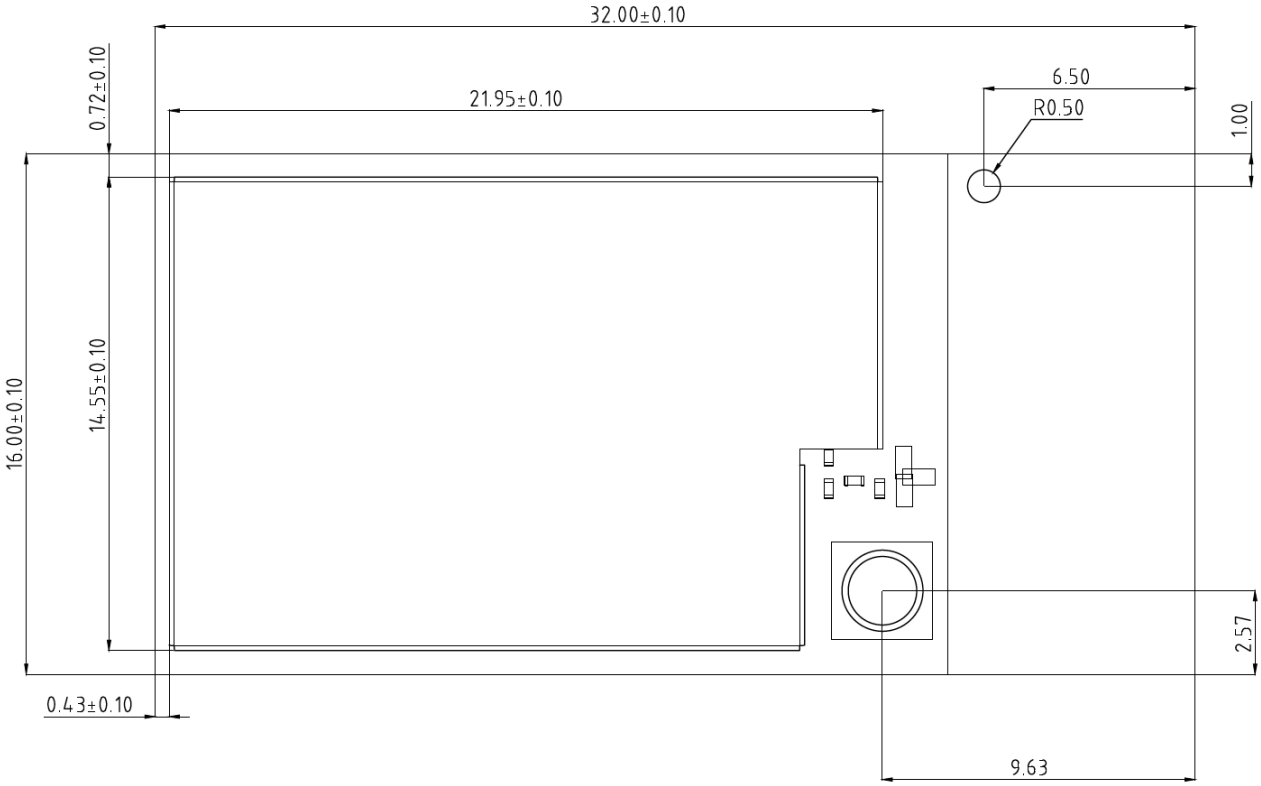
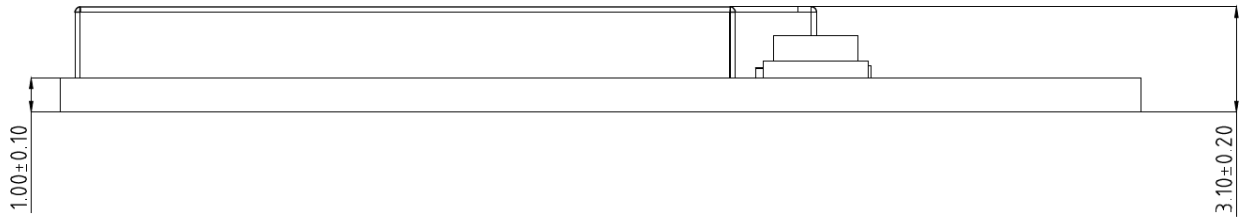
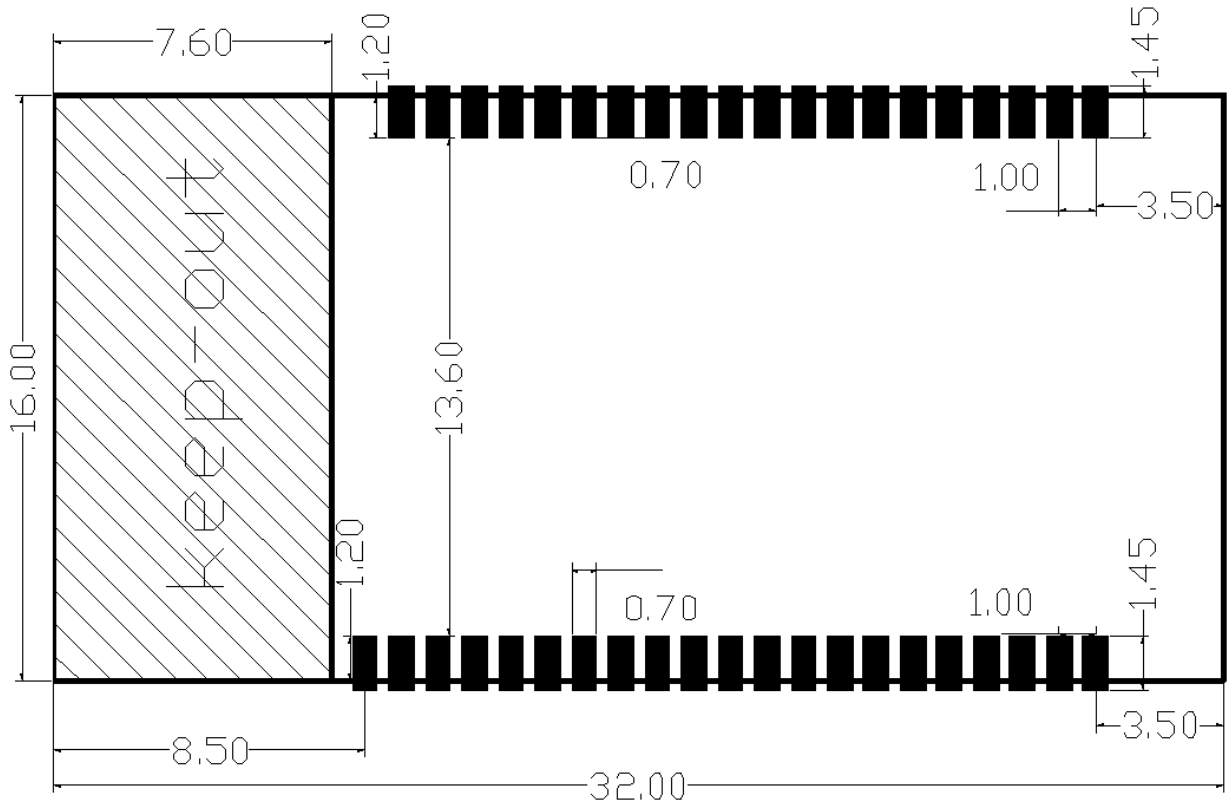


Figure 6.2 EMW3165 side view(Unit: mm)



6.2 **Recommended Footprint Design**

Figure 6.3 Recommended footprint(Unit: mm)



6.3 **Recommended Reflow Profile**

Solder paste recommendations: SAC305, Lead -Free solder paste.

Reflow times<= 2times (Max.)

1.Max Rising Slope : 3℃/sec

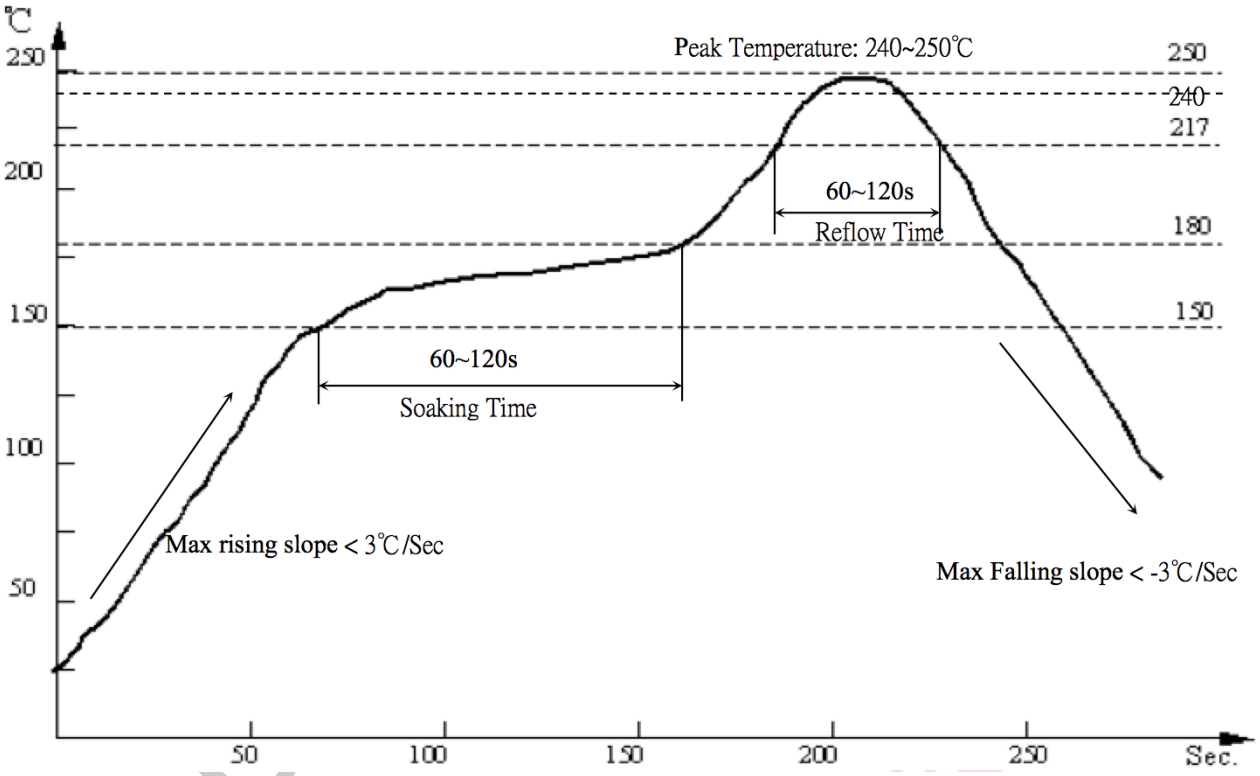
2.Max Falling Slope: -3 ℃/sec

3.Soaking Time(150℃~180℃): 60sec~120sec

4.Over 217℃ Time:60sec~120sec ;

5.Peak Temp.240℃~250℃

Figure 6.4 Recommended reflow profile



6.4 **MSL/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

7 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

8 Technical Support

If you need to get the latest information on this product or our other product information, user can visit: http://www.mxchip.com/

If user need to get technical support, please call us during the working hours:

ST ARM technical support

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

Wireless network technical support

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Development tools technical support

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9 Revision history

Data	Revision	Changes
2015-1-26	1.0	Initial release.