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MXCHIP® | Global leading IOT operating system-MiCO

DATASHEET	**EMW3239**
	Embedded Wi-Fi Module
Virson: 0.9 Date：2016-12-8	No.：DS0046CN

Abstract

Features:

● Dual Mode Bluetooth + Wi-Fi Combo;

● Cortex-M4 MCU and Wi-Fi/Bluetooth Radio-Frequency Chip;

● 256KB SRAM, 1MB on-chip Flash and 2MB off-chip SPI Flash

● Operating voltage: DC 2.66V~3.6V ;

● Bandwidth: 20MHz. Maximum transmission rate: 72.2Mbps

● Wi-Fi properties

- Support 802.11b/g/n

- Support station and Soft AP mode

- Baud Rate: 921600

● Bluetooth properties

- Classic Bluetooth and Low Power Bluetooth(dual mode)

- Support Bluetooth 4.1

● Antenna: On-board PCB Antenna or IPEX Antenna

● Peripherals：

- 1x I^2C

- 2x USART

- SPI/I^2S

- CAN

- Up to 30 GPIOs with hardware interruption

- 12-bit, 2.4MSPS ADC

- Serial wire debug (SWD) & JTAG
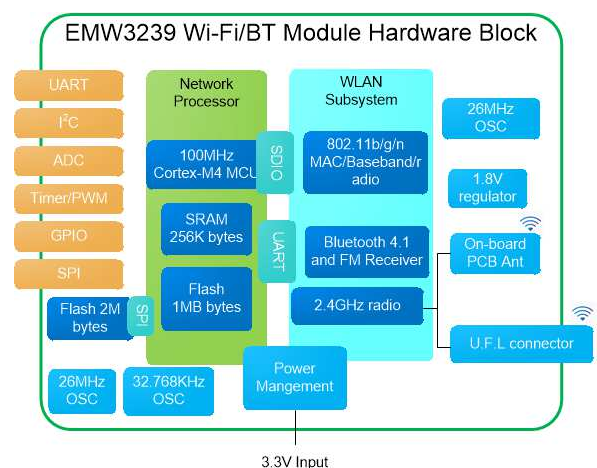
● Operating temperature: -30℃ to +70℃

Applications

● Smart Lighting

● Smart Transportation

● Home Automation

● Healthcare Devices

● Industrial Automation

● Smart Security

● Smart Energy

Device summary

Reference	Antenna Type	Illustration
EMW3239-P	On-board PCB	Default
EMW3239-E	IPX	Optional

Hardware Block

EMW3239 Wi-Fi/BT Module Hardware Block

Copyright Notice

Vision Illustration

Date	Vision	Details
2016-8-5	0.1	Initial document
2016-8-8	0.2	Add module overall figure
2016-8-23	0.3	Add module package and relative performance
2016-8-29	0.4	Add module application and Bluetooth performance. Change clearance zone diagram.
2016-8-30	0.5	Modify band information and clearance zone diagram
2016-12-2	0.6	Add power consumption testing performance
2016-12-6	0.7	Replace label diagram and add module package information
2016-12-8	0.9	Add minimum and maximum current in power consumption.

Content

Figure Content

Table Content

1. Description

EMW3239 is an embedded module supplied by 3.3V voltage with radio-frequency chip with both Wi-Fi and BT4.1 and the ARM Cortex-M4 MCU operating at a 100 MHz frequency. SRAM up to 256KB, on-chip Flash up to 1MB and off-chip up to 2MB. EMW3239 has abundant peripherals supplied for different Wi-Fi and BT devices.

EME3239 contains 2.4GHz WLAN IEEE 802.11 b/g/n MAC/Baseband/Radio and Bluetooth 4.1 (Supportable with BLE). Power amplifier is suitable for output power demand in massive devices. EMW3239 has low noise amplifier with best receive sensitive and internal radio-frequency transmit-receive switch.

The combo scheme with dual mode Bluetooth and Wi-Fi has a wide application scenario. Bluetooth devices (including classic Bluetooth and low power Bluetooth, such as Mxchip BLE Bluetooth module EMB1036 and EMB1066) could connect to internet with EMW3239. Figure 1 shows the typical application of EMW3239.
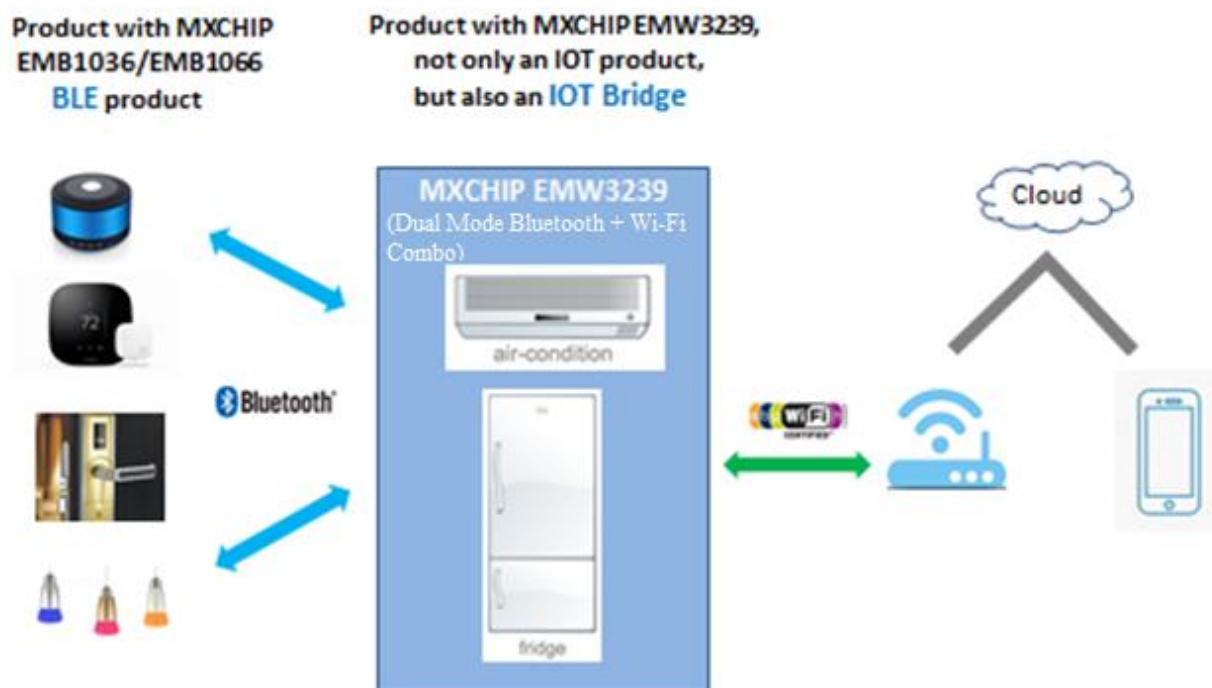
Figure 1 Typical Application of EMW3239

EMW3239 is suitable for secondary development based on MiCO.

Hardware block is shown in figure 2, including 4 parts:

- Cortex-M4

- WLAN MAC/BB/RF/ANT

- Controller and Peripherals

- Power Management

With:

1. Cortex-M4 MCU, maximum operating frequency 100MHz, 256KB SRAM with high speed UART, I2C, SPI, PWM, I2S ADC and GPIO pins;

2. Off-chip SPI Flash has 2MB memories used for firmware custom development;

3. PCB antenna and IPEX antenna;

4. Input voltage: DC 2.66V~3.6V
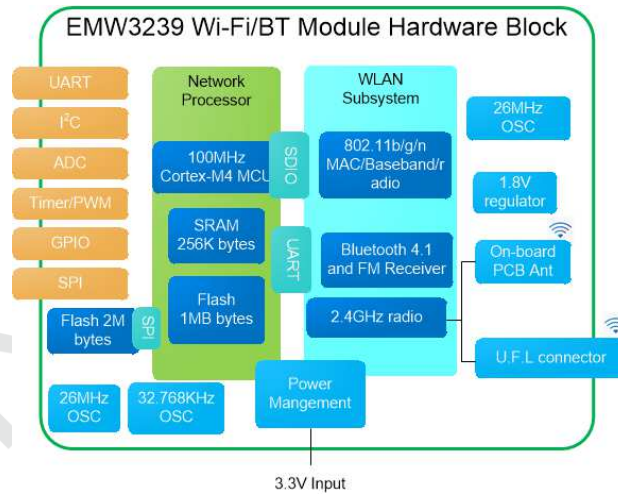
Figure 2 EMW3239Hardware Block

1.1 EMW3239 Lable Information
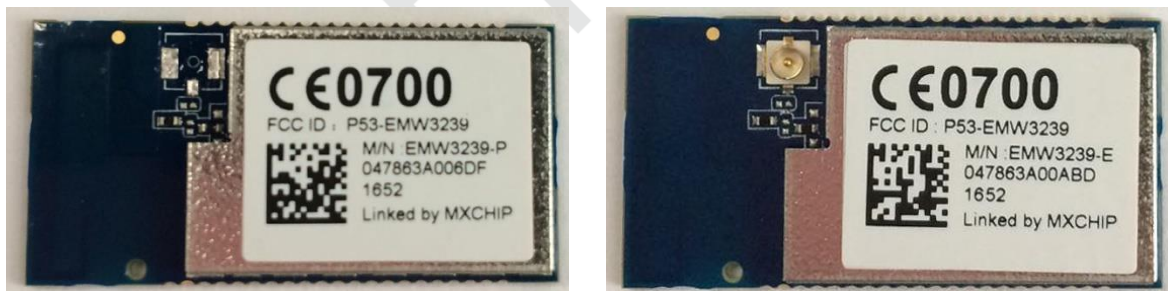
Figure 3 EMW2329 Module

Lable Information:

EMW3239-P/EMW3239-E：Module Information

047863A000A1：MAC Address(Every device has a sole MAC address)

-1643：Production batch.

1.2 Pin arrangement

EMW3239 has 41 pins in two rows (1x20 and 1x21) with 0.8mm pitch. Stamp hole package interface design is used in EMW3239 (as shown in figure 3) to simplify debugging and disassembling for developers, as well as offering varied selection. Also it is benefit for SMT patch and hand-welding.

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.
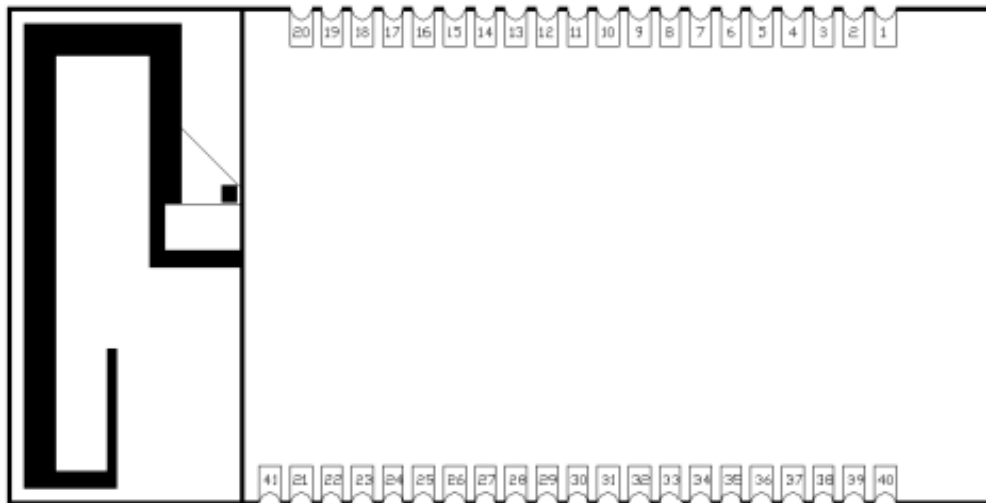
Figure 4 Pin Arrangement
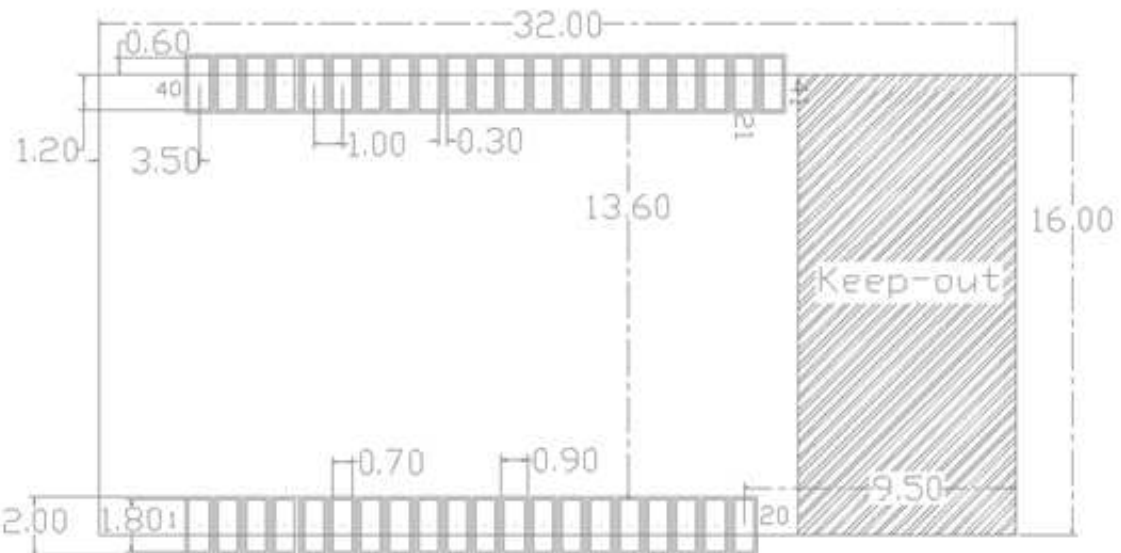
Figure 5 Package Size of EMW3239

1.3 Pin Definition

1.3.1 EMW3239 Package Definition
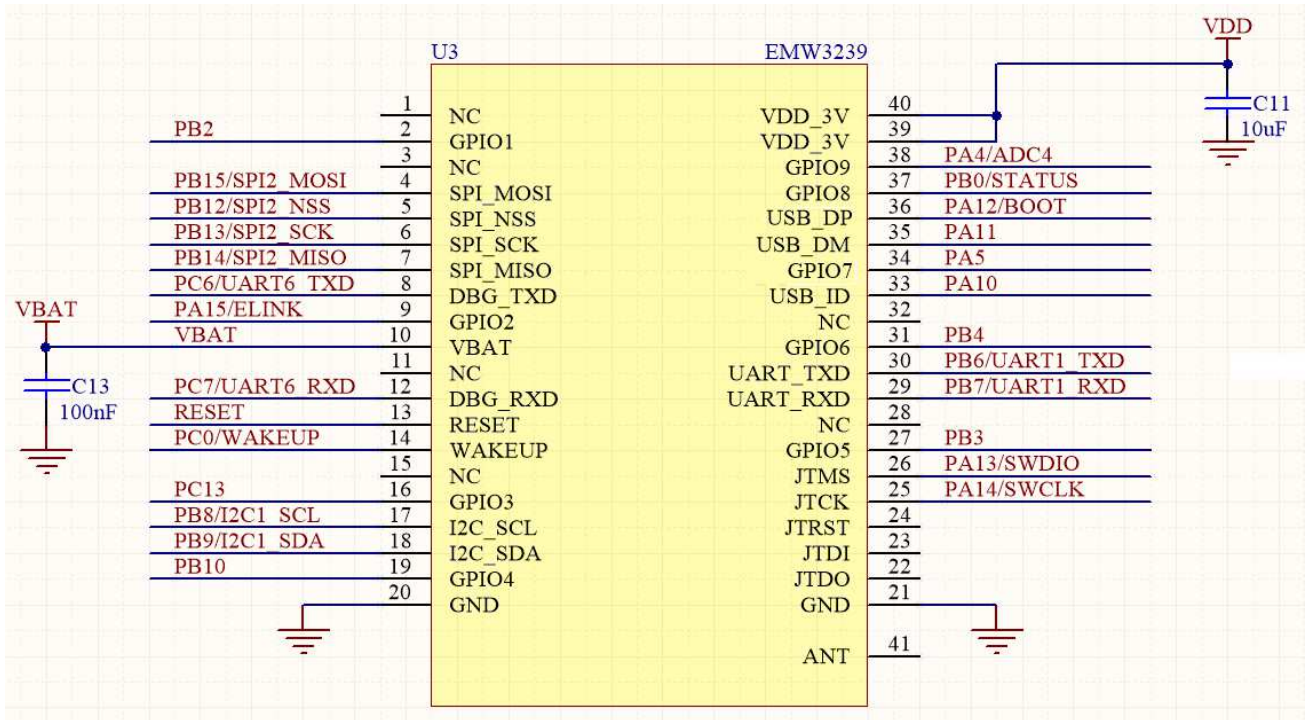
Figure 6 Package Definition of EMW3239

1.3.2 EMW3239 Pin definition

Table 1 Pin Definition of EMW3239

Pins	Name	Type	I/O Level	Multi-select Function				User
1	-	-	-					NC
2	PB2	I/O	FT	GPIO			BOOT1	√
3	-	-	-					NC
4	PB15	I/O	FT	SPI2_MOSI	GPIO	TIM12_CH2	I2S2_SD	√
5	PB12	I/O	FT	SPI2_NSS	GPIO	CAN2_RX	I2S2_WS	√

Pins	Name	Type	I/O Level	Multi-select Function				User
6	PB13	I/O	FT	SPI2_SCK	GPIO	CAN2_TX	I2S2_CK	√
7	PB14	I/O	FT	SPI2_MISO	GPIO	TIM12_CH1		√
8	PC6	I/O	FT	UART6_TXD	GPIO	TIM3_CH1	I2S2_MCK	×*DEBUG_OUT*（*Unusable*）
9	PA15	I/O	FT	GPIO	JTDI	TIM2_CH1	USART1_TXD	×（EasyLink）
10	VBAT	S	-	VBAT				×
11	-	-	-					NC
12	PC7	I/O	FT	UART6_RXD	GPIO	TIM3_CH2	I2S2_CK	×*DEBUG_IN*（*Unusable*）
13	NRST	I/O	FT	RESET				×
14	PC0	I	TC	GPIO			WAKEUP	√
15	-	-	-					NC
16	PC13	I/O	FT	GPIO				√
17	PB8	I/O	FT	I2C1_SCL	GPIO	TIM4_CH3	CAN1_RX	√
18	PB9	I/O	FT	I2C1_SDA	GPIO	TIM4_CH4	CAN1_TX	√
19	PB10	I/O	FT	GPIO		TIM2_CH3	I2S2_CK	√
20	GND	S	-	GND				×
21	GND	S	-	GND				×

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Pins	Name	Type	I/O Level	Multi-select Function				User
22	-	-	-					NC
23	-	-	-					NC
24	-	-	-					NC
25	PA14	I/O	FT	SWCLK				✕
26	PA13	I/O	FT	SWDIO				✕
27	PB3	I/O	FT	GPIO		TIM2_CH2	USART1_RXD	√
28	-	-	-					NC
29	PB7	I/O	FT	UART1_RXD	GPIO	TIM4_CH2	I2C1_SDA	√ *USER_UART_RX*
30	PB6	I/O	FT	UART1_TXD	GPIO	TIM4_CH1	I2C1_SCL	√ *USER_UART_TX*
31	PB4	I/O	FT	GPIO	JTRST	TIM3_CH1		√
32	-	-	-					NC
33	PA10	I/O	FT	USB_ID	GPIO	TIM1_CH3		√
34	PA5	I/O	TC	GPIO			ADC1_5	√
35	PA11	I/O	FT	USB_DM	GPIO	TIM1_CH4	UART1_CTS	√
36	PA12	I/O	FT	USB_DP	GPIO	TIM1_ETR	UART1_RTS	✕（BOOT）
37	PB0	I/O	FT	GPIO			ADC1_8	✕（STATUS）
38	PA4	I/O	TC	GPIO			ADC1_4	√
39	VDD	S	-	3.3V				✕
40	VDD	S	-	3.3V				✕
41	ANT	-	-	ANT				✕

Illustration:

1. Pin 10, pin 39 and pin 40 should be connected to VDD 3V3, pin 20 and pin 21 should be connected to ground;

2. Pin 8 and pin 12 could only be used in secondary write, ATE or QC automatic detection;

3. Pin 29 and pin 30 is used as serial communication in bootloader mode for users;

4. S stands for power supply, I stands for input pins and I/O stands for input and output pins;

5. FT= 5V tolerant, The maximum voltage should be less than VCC when set as analog input/output or clock oscillation circuit;

6. TC= 3.6V as convention input/output voltage;

7. SWD(pin 25, pin 26) is used to debug and download firmware instead of JTAG;

8. Pins are not available for users with signature "X" while pins with signature " √ " is available for users;

9. For other information please contact technical support.

2. ROHS Statement

EMW3239 is certified by global leading inspection, verification, testing and certification company SGS. The certified request refers to EU ROHS 2011/65/EU re-modified from 2002/95/EC.

Verification Methods:

1. Refer to IEC 62321-2: 2013, split sample;

2. Refer to IEC 62321-1: 2013, tested and analyzed the sample as shown in the report pictures:

   1) Refer to 2321-3-1:2013, screening sample by energy dispersive X ray fluorescence analysis instrument;

   2) Wet chemical test:

   a) Refer to IEC 62321-5: 2013, determinate cadmium by ICP-OES;

   b) Refer to IEC 62321-5: 2013, determinate lead by ICP-OES;

   c) Refer to IEC 62321-4: 2013, determinate mercury by ICP-OES;

   d) Refer to IEC 62321: 2008, determinate Hexavalent chromium by point test method and colorimetry;

   e) Refer to IEC 62321: 2008, determinate Polybrominated Biphenyl and Polybrominated Diphenyl Ethers by GC-MS.

Verification conclusion:

According to the qualification of the sample, test results of cadmium, lead, mercury, Hexavalent chromium, Polybrominated Biphenyl, Polybrominated Diphenyl and four phthalates (DEHP, BBP, DBP and DIBP) meet the certified request refers to EU ROHS 2011/65/EU re-modified from 2002/95/EC.

Please download the RHOS test report of EMW3239 from：www.mxchip.com

3. Electrical Parameters

3.1 Operating Conditions

EMW3239 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	——	2.66	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.

Rated current parameters:

Table 3 Current Parameters

Symbol	Description	Minimum	Unit
IVDD	Total input current in VDD	320	mA
IO	Output current from any I/O pin or control pin	25	mA
	Output current source from any I/O pin or control pin	-25	mA

Rated power is only used as pressure test parameter. Permanent damage would be caused if the device works in this condition.

3.2 Absolute Maximum Ratings (Voltage)

Permanent damage in hardware would be caused if the device operates at the voltage over rated value. Maximum rated value is harmful to the device. Meanwhile, reliability could be influenced when the device has long-term operating at maximum voltage.

Table 4 Absolute Maximum Ratings

Symbol	Illustration	Minimum	Maximum	Unit
V_{DD}	Power supply	–0.3	4.0	V
V_{OUT}	Output Voltage from 5V voltage pins	−0.3	5.5	V
V_{IN}	Input voltage from other pins	−0.3	$V_{DD}+0.3$	V

Actual working current is variable at different operating mode.

3.3 Power Parameters

Table 5 Power Parameters of EMW3239

WI-FI Mode

Status	Current（3V3）			Description
	Minimum	Typ.	Maximum	
WIFI Initialization	12.39mA	13.93mA	42.83mA	Disable WIF, low power consumption
Connect WIFI	49.50mA	51.81mA	363.50mA	Disable WIF, low power consumption
Connect WIFI	12.3mA	15.61mA	86.70mA	Enable WIF, low power consumption
Connect WIFI	2.32mA	5.54mA	92.79mA	WIFI&MCU with low power consumption
UDP transmission	46.3mA	62.54mA	358.10mA	Disable WIF, low power consumption
SoftAP mode	48.20mA	56.95mA	321.70mA	SoftAP connect to internet
Easylink mode	51.51mA	57.84mA	213.62mA	Process of module network distribution
Standby mode	15.84uA	19.91uA	50.83uA	MCU in Standby mode, disable RF

BLE Mode

Status	Current（3V3）			Description
	Minimum	Typ.	Maximum	
Bluetooth Initialization	8.94mA	9.12mA	10.04mA	Bluetooth Initialization, WIFI disabled
Bluetooth high speed broadcast	8.4mA	11.58mA	72.40mA	Transmit data each 30ms
Bluetooth low speed broadcast	8.81mA	9.62mA	82.63mA	Transmit data each 30ms
Bluetooth scanning	8.61mA	18.45mA	76.94mA	Bluetooth scans slave devices
Bluetooth data transmission	9.49mA	12.40mA	58.71mA	Transmit data as host
Bluetooth data reception	8.95mA	11.59mA	70.69mA	Receive data as slave

Bluetooth Classic Mode

Status	Current（3V3）			Description
	Minimum	Typ.	Maximum	
Could be found by other bluetooth	8.85mA	9.94mA	95.40mA	Bluetooth Initialization，WIFIdisabled
Data transmission	12.90mA	16.62mA	63.70mA	Transmit data as host
Data reception	9.86mA	14.76mA	72.17mA	Receive data as slave

Actual working current is variable at different operating mode.

3.4 Working Environment

Table 6 Temperature and humidity condition

Symbol	Name	Maximum	Unit
TSTG	Storage Temperature	-55 to +125	℃
TA	Operation Temperature	-30 to +70	℃
Humidity	Non-condensing, Relative humidity	95	%

3.5 Electrostatic Discharge

Table 7 Electrostatic Discharge Parameters

Symbol	Name	Details	Level	Maximum	Unit
V_{ESD}(HBM)	Electrostatic discharge voltage (Human module)	TA= +25 °C, JESD22-A114	2	2500	V
V_{ESD}(CDM)	Electrostatic discharge voltage (Discharge device module)	TA = +25 °C, JESD22-C101	II	500	

4. RF parameters

4.1 Basic RF parameters

Table 8 Radio-frequency standards

Name		Illusition
Working frequency		2.412~2.484GHz
Wi-Fi wireless standard		IEEE802.11b/g/n
Data transmission rate	20MHz	11b：1,2,5.5and 11Mbps 11g : 6,9,12,18,24,36,48,54Mbps 11n : MCS0~7,72.2Mbps
Antenna type		On-board PCB （Default） IPX （Optional）

4.2 TX Performance (TBD)

4.2.1   Transmit performance of IEEE802.11b mode

Table 9 CCK_11 transmit performance parameters of IEEE802.11b mode

Channel	Output Power （dBm）	EVM(dBm)	Frequency off-set (ppm)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			

4.2.2   Transmit performance of IEEE802.11g mode

Table 10 OFDM_54 transmit performance parameters of IEEE802.11g mode

Channel	Output Power（dBm）	EVM（dBm）	Frequency off-set (ppm)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			

4.2.3   Transmit performance of IEEE802.11n-HT20 mode

Table 11 MCS7 transmit performance parameters of IEEE802.11n-HT20 mode

Channel	Output Power（dBm）	EVM（dBm）	Frequency off-set (ppm)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

Channel	Output Power（dBm）	EVM（dBm）	Frequency off-set (ppm)
12			
13			

4.3 RX Receive Sensitivity（TBD）

4.3.1　IEEE802.11b mode with bandwidth 20MHz

Table 12 Receive Sensitivity of IEEE802.11b Mode with Bandwidth 20MHz(dBm)

Channel　　　　　　Rate	1M(dBm)	11M(dBm)
	IEEE spec ： -83	**IEEE spec ： -76**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		

4.3.2　IEEE802.11g mode with bandwidth 20MHz

Table 13 Receive Sensitivity of IEEE802.11g Mode with Bandwidth 20MHz(dBm)

Rate　　　　　Channel	6M(dBm)	54M(dBm)
	IEEE spec ： -82	**IEEE spec ： -65**
1		
2		

Rate Channel	6M(dBm)	54M(dBm)
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		

4.3.3　IEEE802.11n-HT20 mode with bandwidth 20MHz

Table 14 Receive Sensitivity of IEEE802.11n-HT20 Mode with Bandwidth 20MHz(dBm)

Channel　　　　Rate	MCS0(dBm)	MCS7(dBm)
	IEEE spec ： -82	**IEEE spec ： -64**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		

5. Bluetooth Performance

Table 15 Bluetooth Performance

Performance	Description
Overall performance	
Bluetooth standard	BT4.1, transmission rate 1Mbps, 2Mbps, 3Mbps
Host interface	UART
Frequency	2402MHz ~ 2480MHz
Channel	79 个
Modulation mode	FHSS, GFSK, DPSK, DQPSK
RF performance	
	Power
Output Power	
Sensitivity at BER=0.1%GFSK(1Mpbs)	
Sensitivity at BER=0.01%π/4-DQPSK (2Mpbs)	
Sensitivity at BER=0.01%8DPSK(3Mbps)	
Maximum output power	GFSK (1Mbps):
	π /4-DQPSK (2Mbps) :
	8DPSK (3Mbps) :

6. Antenna Information

6.1 Antenna Type

EMW3239 has two type of antenna: PCB antenna (EMW3239-p) and IPX antenna (EMW3239-E).

Figure 7 EMW3239-P

Figure 8 EMW3239-E

6.2 Antenna Clearance Zone

Main PCB should have a distance over 15mm with other metal elements when using PCB antenna in Wi-Fi device. Shadow parts in figure 9 should keep away from metal elements, sensor, interference source and other material that could cause signal interference.
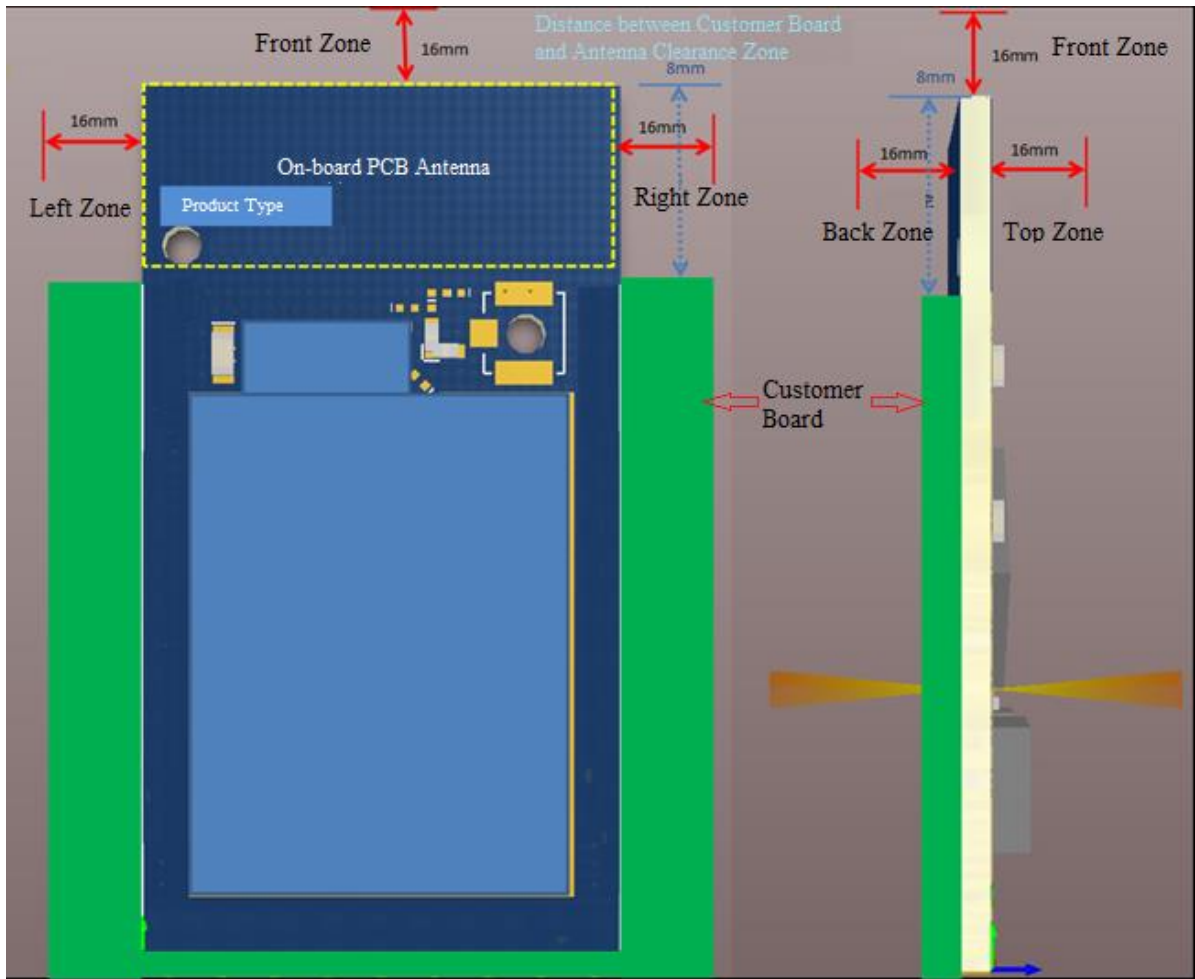
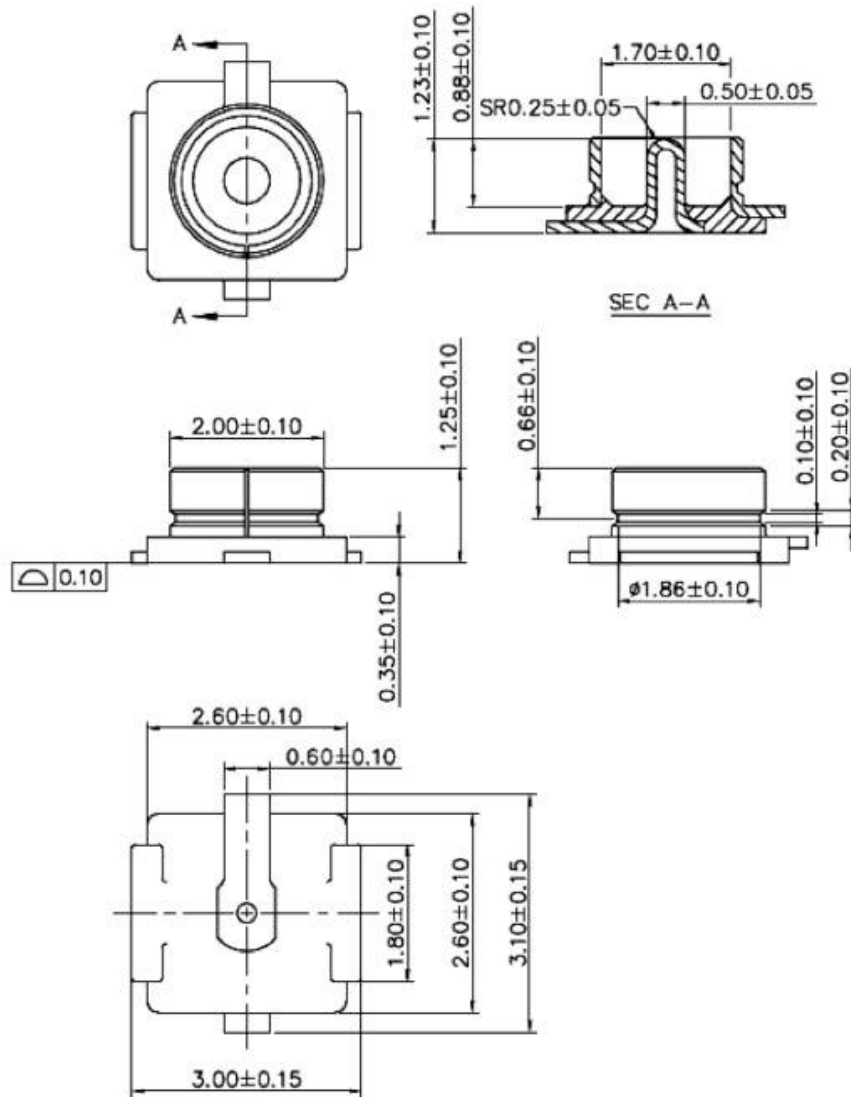Figure 9 Minimum Clearance Zone of PCB Antenna

6.3 External Antenna Connector

Figure 10 Size of External Antenna Connector

7. Assembly Information and Production Guidance

7.1 Assembly Size

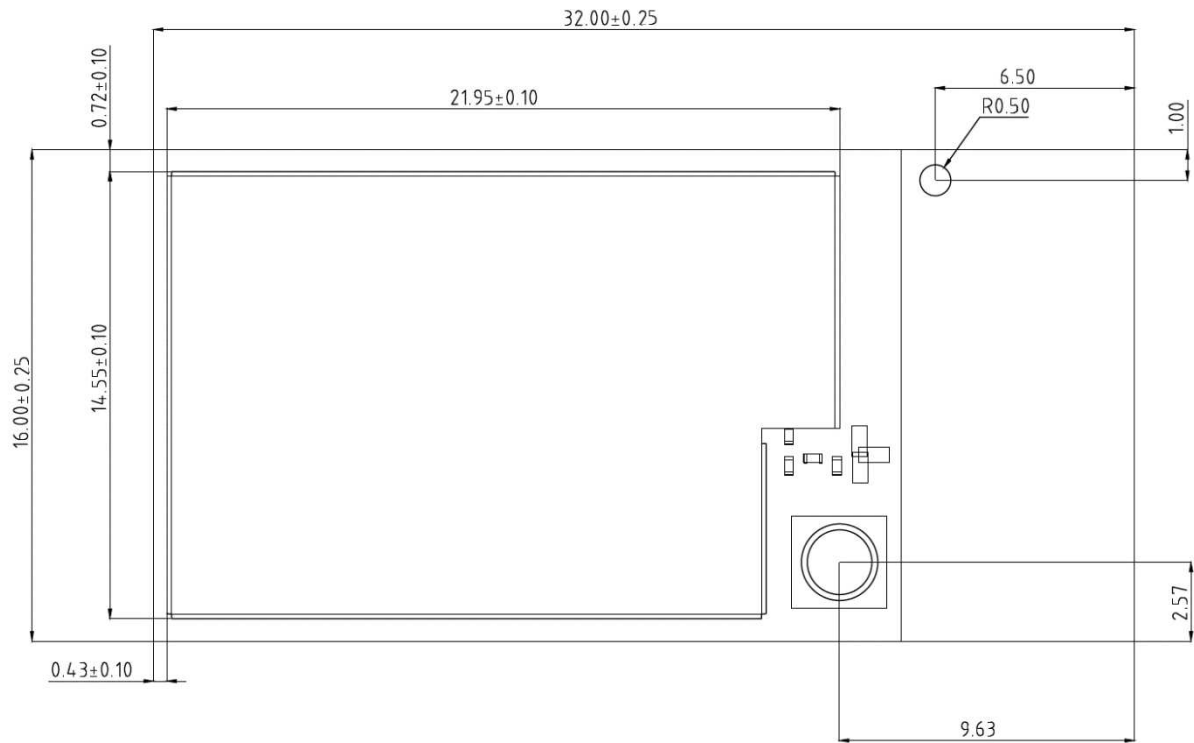Top view of mechanical dimension is shown in figure 12 (Unit: mm)

Figure 11 Top View

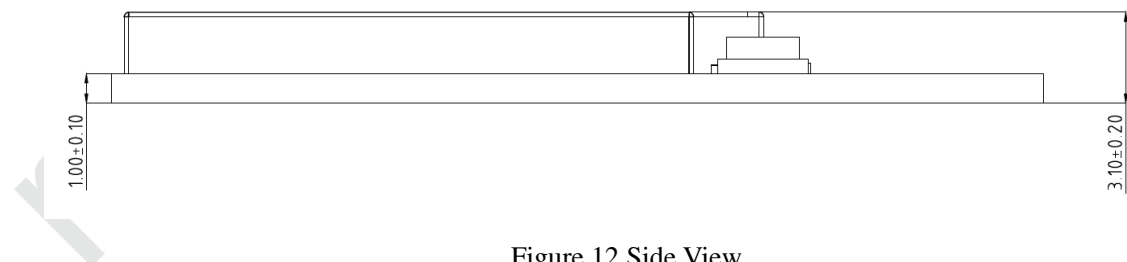Side view of mechanical dimension is shown in figure 13 (Unit: mm)

Figure 12 Side View

7.2 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.