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# EMW110

**MXCHIP<sup>®</sup>** | 智能硬件解决方案提供商

Ver1.7

# About this document

This document is about EMW110 MCU WIFI module's hardware specification, and it contains below contents:

| Chapter   | Title                 | Content                                                               |
|-----------|-----------------------|-----------------------------------------------------------------------|
| Chapter 1 | Brief introduction    | Main specification introduction                                       |
| Chapter 2 | Pin definition        | Pin assignment and description                                        |
| Chapter 3 | Function description  | Function and IO description, including CPU, Flash, RAM and interfaces |
| Chapter 4 | Electrical parameters | Electrical parameters                                                 |

Version history:

| Date       | Version | Release note                                  |
|------------|---------|-----------------------------------------------|
| 2017.7     | V1.0    | First version                                 |
| 2017.8     | V1.1    | Update mechanical drawing                     |
| 2017.9.8   | V1.2    | Update                                        |
| 2017.10.12 | V1.3    | Update flash size                             |
| 2017.11.08 | V1.4    | Update Section3.5 working mode truth table    |
| 2017.12.19 | V1.5    | Section3.4.1, add UART support for 8 bit data |
| 2018.1.5   | V1.6    | Update figure 2-1 Dimension Top view          |
| 2018.3.2   | V1.7    | Update test data                              |

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# Content

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EMW100 is a MCU WIFI module with dimension 18 mm x 20 mm x 3 mm. It supports 2dBi PCB antenna or IPEX connector.

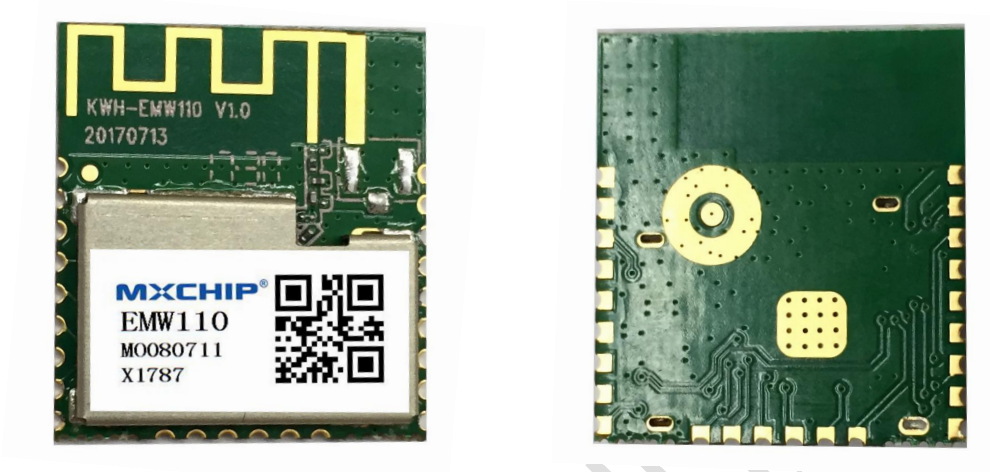


Figure 1-1. EMW110

Table 1-1. EMW110 Specification

| Type     | Item                  | Specification                                 |
|----------|-----------------------|-----------------------------------------------|
| Wireless | Certification         | SRRC/FCC/CE                                   |
|          | Wi-Fi protocol        | 802.11 b/g/n                                  |
| Hardware | Frequency             | 2412MHz ~ 2472MHz                             |
|          | Interface             | UART×2, SPI×1, USB×1, ADC×1                   |
|          | Operating voltage     | 3.0V ~ 3.6V                                   |
|          | Current               | Average:80 mA                                 |
|          | Operating temperature | -20° C ~ 70° C                                |
|          | Storage temperature   | -40° C ~ 85° C                                |
|          | Dimension             | 18 mm x 20 mm x 3 mm                          |
| Software | WiFi mode             | Station, SoftAP, SoftAP + Station             |
|          | Encyption             | WPA/WPA2/WEP/TKIP/AES                         |
|          | Firmware programming  | SPI/UART/OTA/                                 |
|          | Software development  | AT command<br>Develop by SDK                  |
|          | Network protocol      | IPv4/IPv6, TCP/UDP/HTTP/FTP/HTTPS/SSL/MQTT    |
|          | IOT Cloud support     | Aliyun, Amazon, JD, Suning, Huawei, Microsoft |

EMW110 Pin assignment Top view (Unit: mm)

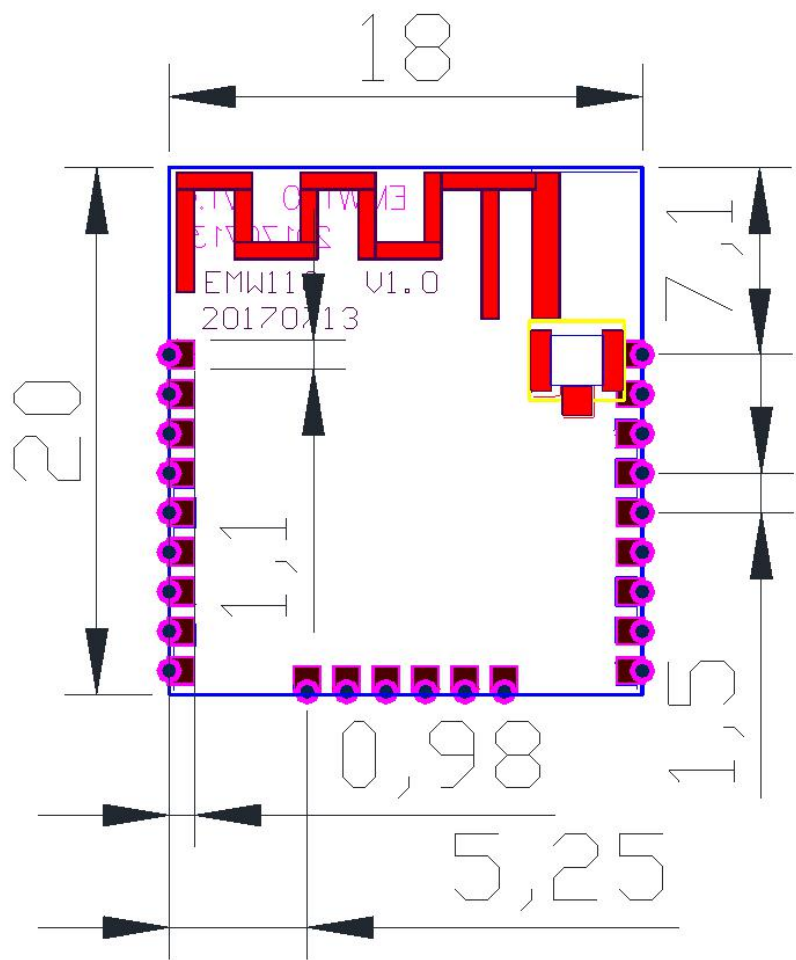


Figure 2-1. EMW110 Dimension Top view

Table 2-1. EMW110 Dimension

| Length | Width | Height | PAD size(bottom) | Pitch size |
|--------|-------|--------|------------------|------------|
| 18mm   | 20 mm | 2.8 mm | 3.0mm x 3.2 mm   | 1.5 mm     |

Table 2-2. EMW110 Pin Definition

| NO. | Name      | Funtion                                                                                 |
|-----|-----------|-----------------------------------------------------------------------------------------|
| 1   | VCC_3V3   | 3.3V power supply (VDD)<br>Note: The max current of power supply should be above 500mA. |
| 2   | CHIP_EN   | Chip Enable. Internal Pull High in module.                                              |
| 3   | GPIO_14   | GPIO14/SD_CLK/SPI_CLK                                                                   |
| 4   | GPIO_17   | GPIO17/SD_DATA1/SPI_MISO                                                                |
| 5   | GPIO_16   | GPIO16/SD_DATA0/SPI_MOSI                                                                |
| 6   | GPIO_15   | GPIO15/SD_CMD/SPI_CSN                                                                   |
| 7   | GPIO_11   | GPIO11/UART1_TX (debug UART-TX)                                                         |
| 8   | GPIO_10   | GPIO10/UART1_RX (debug UART-RX)                                                         |
| 9   | GND       | Ground                                                                                  |
| 10  | VDD_FLASH | Power supply for internal flash (for firmware programming)                              |
| 11  | DIG_TEST  | Digital test enable, active high(for firmware programming)                              |
| 12  | FLASH_SCK | GPIO20/I2C1_SCL/JTAG_TCK/FLASH_SCK (for firmware programming)                           |
| 13  | FLASH_CSN | GPIO21/I2C1_SDA/JTAG_TMS/FLASH_CSN (for firmware programming)                           |
| 14  | FLASH_SI  | GPIO22/XHO/JTAG_TDI/FASH_SI (for firmware programming)                                  |
| 15  | FLASH_SO  | GPIO23/JTAG_TDO/FLASH_SO (for firmware programming)                                     |
| 16  | GPIO_30   | GPIO30/USB_DN                                                                           |
| 17  | GPIO_01   | GPIO1/ I2C2_SDA/UART2_RX (user UART-RX)                                                 |
| 18  | GPIO_31   | GPIO31/ I2C2_SCL/UART2_TX (user UART-TX)                                                |
| 19  | GND       | Ground                                                                                  |
| 20  | GPIO_29   | GPIO29/USB_DP                                                                           |
| 21  | NC        | Not connected                                                                           |
| 22  | GPIO_4    | GPIO4/ADC1                                                                              |
| 23  | GND       | Ground                                                                                  |

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GND

Ground

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3.

Function description

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### 3.1. MCU

EMW110 integrates ARM9 MCU with frequency up to 120MHz.

### 3.2. RAM, Flash

EMW110 integrates 256Kbytes RAM, and 2Mbytes Flash.

### 3.3. Clock

EMW110 should work with 26MHz crystal, with 10pF load capacitor,  $\pm 10$  PPM accuracy.

### 3.4. Interface

#### 3.4.1 UART

There are two UARTs in EMW110: user UART and debug UART. The max baud rate can be up to 6Mbps. It supports 5/6/7/8 bit data.

#### 3.4.2 SPI

EMW110 supports high speed SPI with clock frequency up to 50MHz.

Support master and slave mode.

SDIO (in the same pins with SPI) supports master and slave mode with clock frequency up to 50MHz.

#### 3.4.3 I2C

There are two I2C in EMW110, and the max frequency is 400kHz.

#### 3.4.4 USB

Support full speed USB2.0 protocol. Support host and device.

#### 3.4.5 ADC

Support 10-13 bit output.

#### 3.4.6 GPIO

Support up to 14 GPIOs. Every GPIO supports interrupt, and can be wake up pin in sleep mode.

#### 3.4.7 CHIP\_EN

CHIP\_EN is system enable pin. When in high voltage, module is on. When in low voltage, module is off. Please make sure CHIP\_EN is high when power on.

### 3.4. Software programming

There are 6 test pins in the bottom, and they are connected with module pin10~15.

These 6 pins and GPIO\_4, GPIO\_14 are used for software programming.

Table 3-1. Programming mode and working mode Truth table

| Pin      | Programming mode | Working mode |
|----------|------------------|--------------|
| DIGTEST  | H                | L/NC         |
| VDDFLASH | H                | /            |
| IO04     | H                | /            |
| IO14     | L/NC             | /            |

### 3.5. Working mode

EMW110 supports four working modes: bootloader mode, normal work mode, ATE test mode, and QC mode. These mode are configured by three pins: BOOT, STATUS, ELINK.

Note: in below table, 1 means high voltage level, 0 means low voltage level. All the three IOs are internally initialized as input pull high.

Table 3-2. Working mode truth table

| Pin                | GPIO_31 | GPIO_30 | GPIO_29 |
|--------------------|---------|---------|---------|
| Pin Function       | BOOT    | STATUS  | ELINK   |
| Bootloader mode    | 0       | 1       | 1       |
| Normal work mode   | 1       | x       | x       |
| ATE test (RF test) | 0       | 1       | 0       |
| QC mode            | 0       | 0       | 1       |

Note: test condition VDD=3.3V, temperature 25° C

#### 4.1. Absolute maximum rating

Table 4-1. Absolute maximum rating

| Item                          | Specification       | Value     | Unit |
|-------------------------------|---------------------|-----------|------|
| Storage temperature           | —                   | -40 ~ 85  | °C   |
| Maximum soldering temperature | —                   | 260       | °C   |
| Operating voltage             | IPC/JEDEC J-STD-020 | 3.0 ~ 3.6 | V    |

#### 4.2. Operating condition

Table 4-2. Operating condition

| Item                  | Symbol | Min. | Typ. | Max. | Unit |
|-----------------------|--------|------|------|------|------|
| Operating temperature | —      | -20  | 20   | 80   | °C   |
| Operating voltage     | VDD    | 3.0  | 3.3  | 3.6  | V    |

#### 4.3. Digital IO characteristic

Table 4-3. Digital IO characteristics

| Item        | Symbol | Min.     | Max.       | Unit |
|-------------|--------|----------|------------|------|
| Input low   | VIL    | -0.3     | -0.25 VDD  | V    |
| Input high  | VIH    | 0.75 VDD | -VDD + 0.3 | V    |
| Output low  | VOL    | N        | 0.1 VDD    | V    |
| Output high | VOH    | 0.8 VDD  | N          | V    |

#### 4.4. RF parameters

Table 4-4. RF parameter

| Item              | Min.  | Max.  | Unit |
|-------------------|-------|-------|------|
| Frequency         | 2412  | 2472  | MHz  |
| Out Power         |       |       |      |
| 802.11b 11Mbps    | 17    | 17.7  | dBm  |
| 802.11g 54Mbps    | 12.1  | 12.7  | dBm  |
| 802.11n HT20 MCS7 | 11.1  | 11.7  | dBm  |
| EVM               |       |       |      |
| 802.11b 11Mbps    | -23.6 | -23.8 |      |
| 802.11g 54Mbps    | -27.6 | -25.5 | dB   |

|                   |       |       |     |
|-------------------|-------|-------|-----|
| 802.11n HT20 MCS7 | -30.2 | -28.9 | dB  |
| Min Sensitivity   |       |       |     |
| 802.11b 11Mbps    | -90   | -89   | dBm |
| 802.11g 54Mbps    | -74   | -75   | dBm |
| 802.11n HT20 MCS7 | -70   | -68   | dBm |
| Frequency error   |       |       |     |
| 802.11b 11Mbps    | -1.1  | -0.5  | ppm |
| 802.11g 54Mbps    | -1.1  | -0.8  | ppm |
| 802.11n HT20 MCS7 | -1.3  | -0.9  | ppm |

## 4.5. Power consumption

Test condition: VDD=3.3V, temperature 25° C

Table 4-5. Power consumption

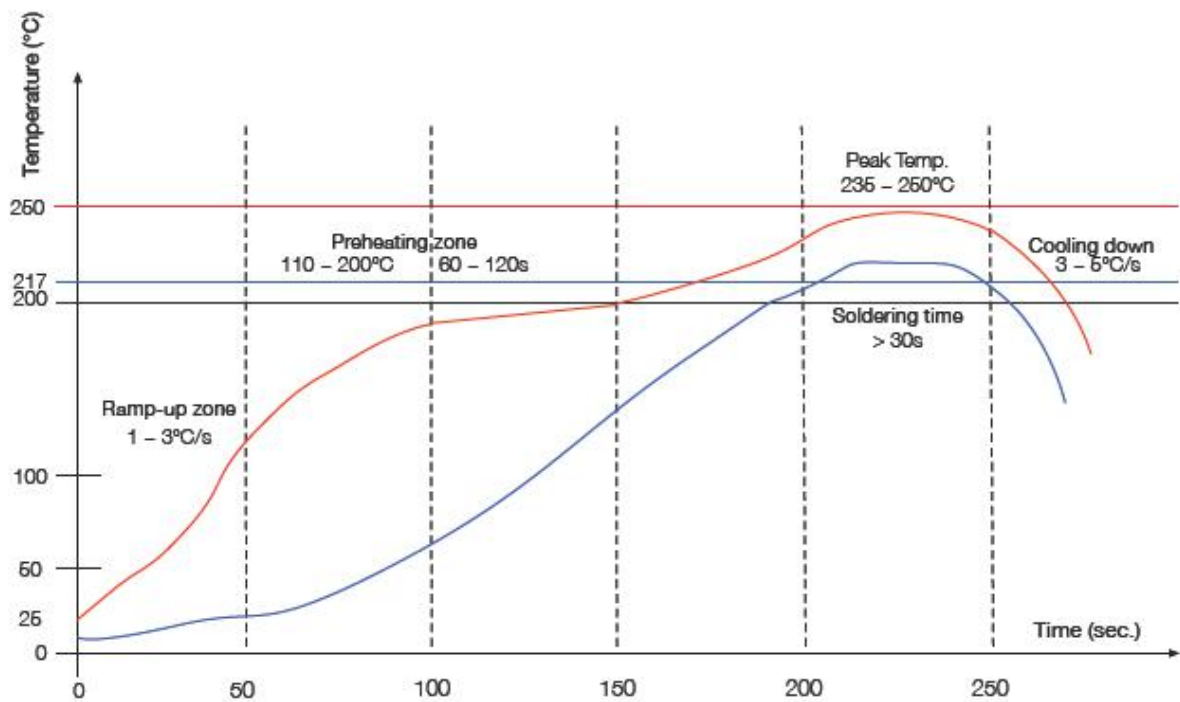
| Mode            | Description                                               | Min. | Typ. | Max. | Unit |
|-----------------|-----------------------------------------------------------|------|------|------|------|
| RF transmission | Output power 12dBm                                        |      | 170  |      | mA   |
| RF receive      | In sensitivity test mode                                  |      | 110  |      | mA   |
| Sleep           | All MCU status keep, MCU stop running                     |      | 100  |      | uA   |
| Standby         | All power off, support wake up by GPIO and internal Timer |      | 10   |      | uA   |

## 4.6. Electro-Static discharge

Table 4-6. ESD parameter

| Name                     | Symbol     | Specification                                            | Level | Max. | Unit |
|--------------------------|------------|----------------------------------------------------------|-------|------|------|
| ESD(Human Body Mode)     | VESD (HBM) | T:23 ± 5°C<br>Follow ANSI / ESDA / JEDEC JS - 001 - 2014 | 2     | 2000 | V    |
| ESD(Charged Device Mode) | VESD (CDM) | T:23 ± 5°C<br>Follow JEDEC EIA / JESD22 - C101F          | C2    | 500  | V    |

## 4.7. Re-flow temperature curve



Ramp-up zone (升温区): Temp. <150°C, Time 60 – 90s, Ramp-up rate 1 – 3°C/s.  
 Preheating zone (预热恒温区): Temp. 150 – 200°C, Time 60 – 120s, Ramp-up rate 0.3 – 0.8°C/s.  
 Reflow soldering zone (回流焊接区): Peak Temp. 235 – 250°C (<245°C recommended), Time 30 – 70s.  
 Cooling down zone (冷却区): Temp. 217 – 170°C, Ramp-down rate 3 – 5°C/s.  
 Sn&Ag&Cu Lead-free solder (SAC305)/焊料为锡银铜合金无铅焊料

Figure 4-1. EMW110 re-flow temperature curve

5.

Packing information

| Part number          | MOQ(pcs) | Packing |
|----------------------|----------|---------|
| EMW110-P<br>EMW110-E | 600      | Tray    |