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EMW3165 _Guide For User Design

Abstract

This note lists the matters need attention in each stage of designing and manufacturing while using MXCHIP module. In order to achieve rapid mass production, application designers need learn this note first. Consider and avoid all possible problems which may happen during designing, manufacturing, firmware programming and testing ahead of time.

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Version Record

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1. Introduction

This note lists the matters need attention in each stage of designing and manufacturing while using MXCHIP module. In order to achieve rapid mass production, application designers need learn this note first. Consider and avoid all possible problems which may happen during designing, manufacturing, firmware programming and testing ahead of time.

Applicative module type:

- EMW3165 series

To note stage:

- Hardware designing
- Firmware programming
- Production SMT
- OTA upgrading

Basic features of module:

- Globally unique MAC ID for each module
- Two antenna designing types:
PCB printed antenna and external one using U.F.L RF connector
- Peak current 320mA @ 3.3V
- In-built production test mode
- In-built OTA mode
- Reflow soldering when SMT
- Working temperature: -40 °C to +85 °C

EMW3165 top view:



Figure 1 EMW3165 top view

EMW3165 model list:

Module model	Antenna type	Description
EMW3162-P	PCB printed Antenna	Default
EMW3162-E	External antenna to IPX	Optional
EMW3162-B	Welding plate antenna	Optional

Hardware block :

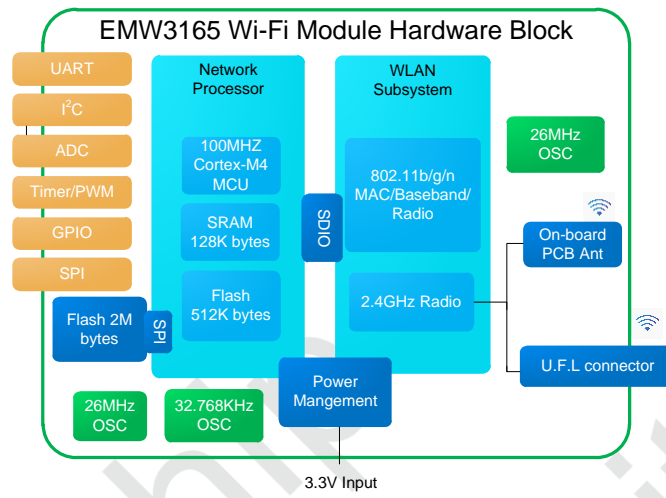


Figure 2 EMW3165 Hardware block

2. Hardware design attention

2.1 Mechanical dimensions

EMW3165 mechanical dimension of vertical view:

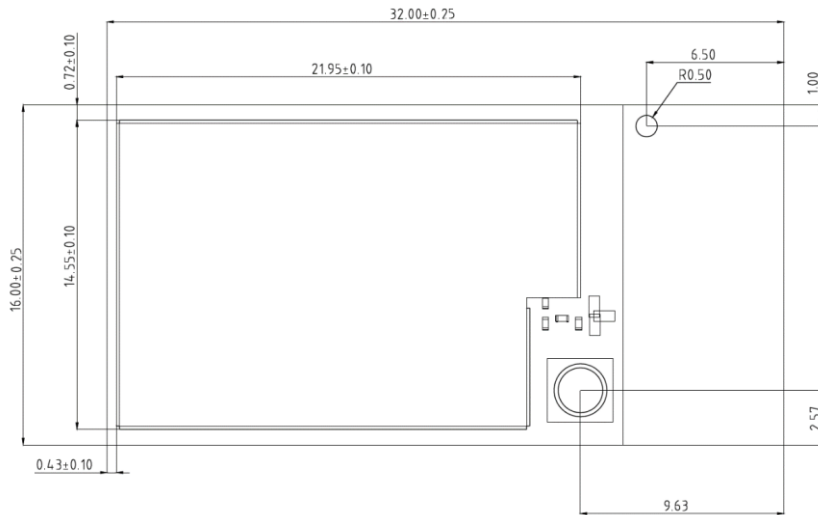


Figure 3 Vertical view

EMW3165 mechanical dimension of side view:

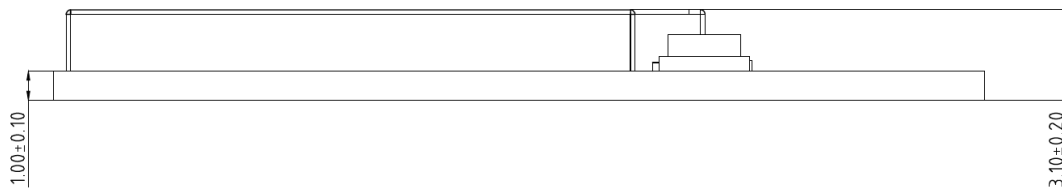


Figure 4 side view

2.2 Recommended package design

The figure followed below is the recommended package design MXCHIP suggested while designing the baseplate.

The solder window has the same size of the pad.

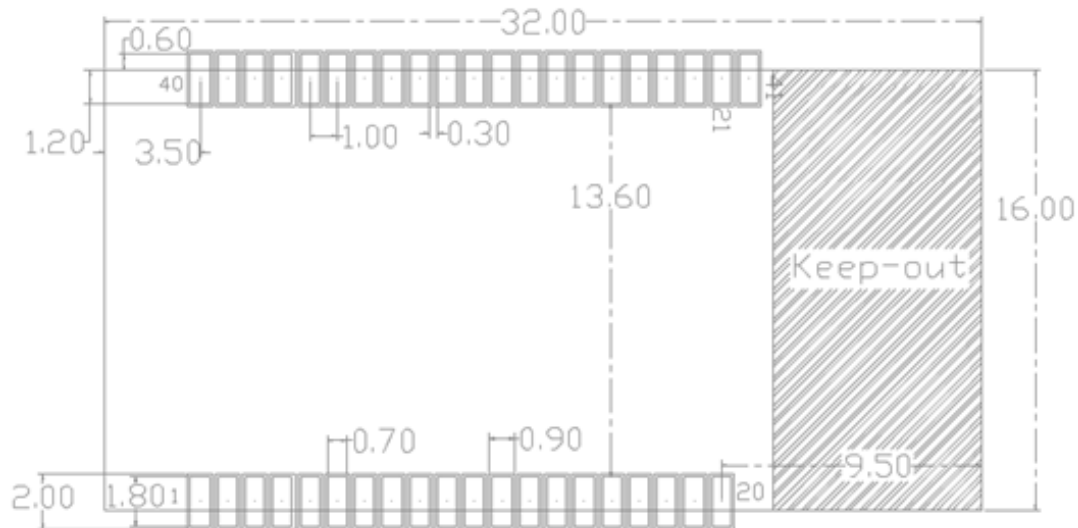


Figure 5 Recommended Package for SMT

2.3 DC power design

Peak current of EMW3165 is about 320mA. The DC/DC power chip MXCHIP recommended should be whose maximum output current is over 600mA. DC/DC gets more superiority on power conversion than LDO.

When using DC/DC power chip, except for the requirements of output voltage (3.3V) and maximum current (600mA), application designer should pay more attention on the arrangement of wires. For instance, device should be compact enough, the ground of input and output should be well connected and the feedback signal should be far away from the inductance and the Schottky diode. Please refer to the datasheet of DC/DC power chip for more information.

When using LDO power chip, application designer need notice on the maximum current (600mA) and heat dissipation.

Set the GND apart from power supply when designing layout to avoid the instantaneous peak current when power on.

2.4 Recommended circuit design

Recommended circuit design for EMW3165:

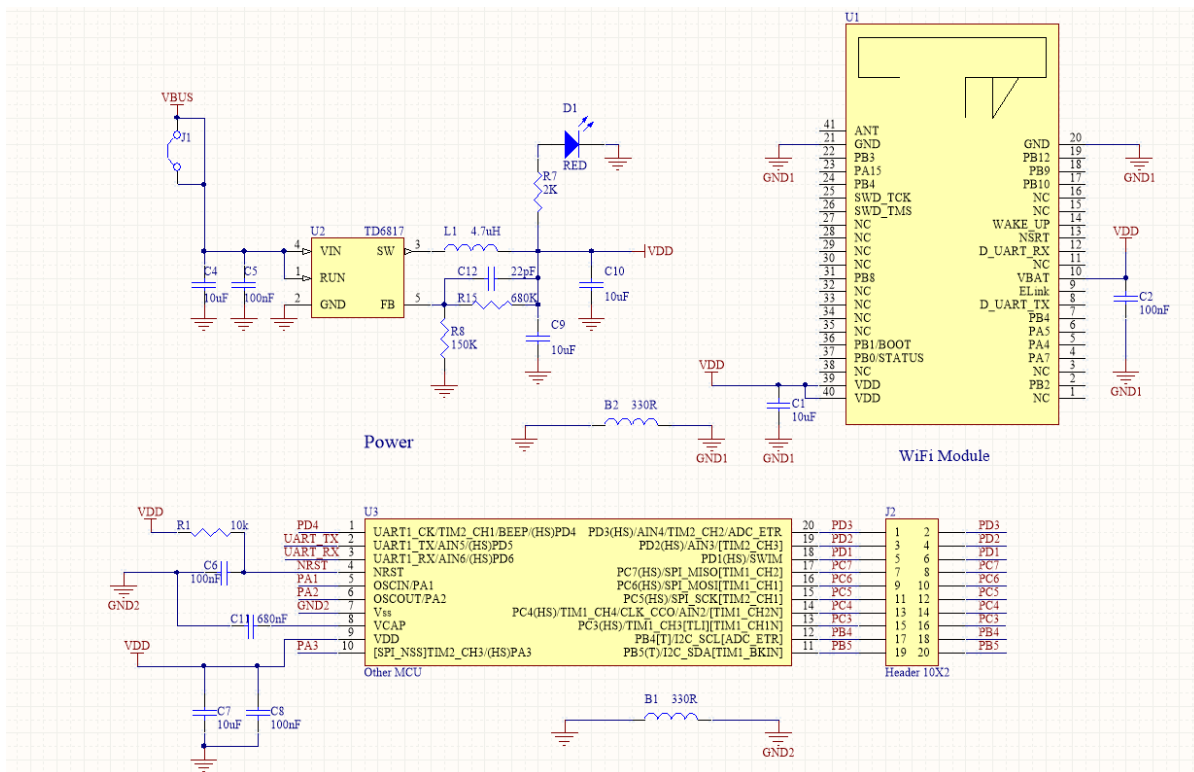


Figure 6 Recommended Circuit Design

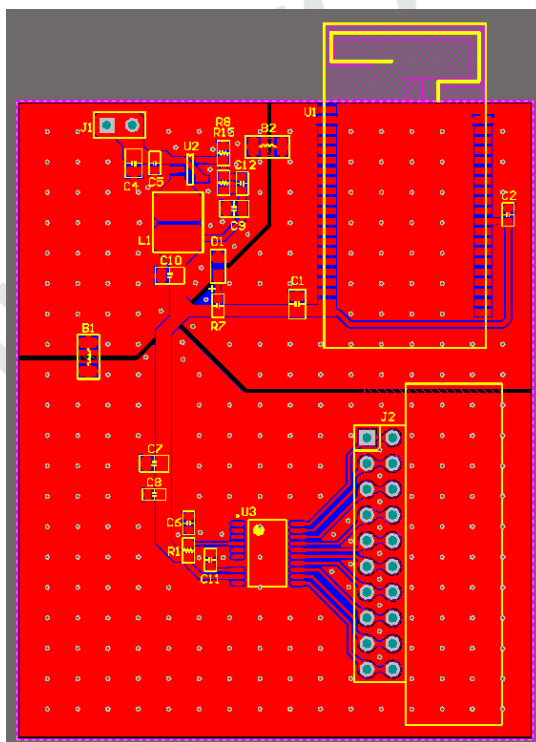


Figure 7 Power Conversion Design

2.5 RF design

2.5.1 PCB antenna design

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. The area under the antenna end of the module should be keep clear of metallic components, connectors, sensors, traces and other materials that can interfere with the radio signal.

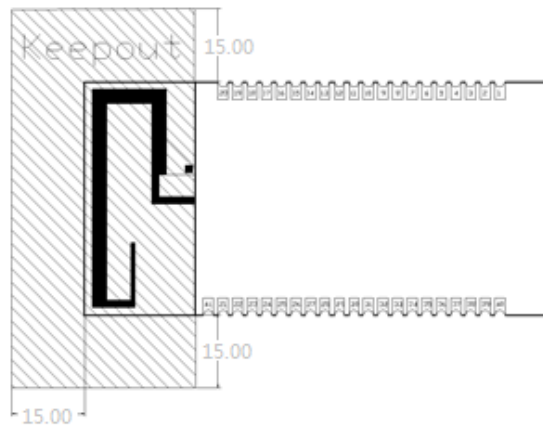


Figure 8 Minimum Size of Keep-out Zone Around Antenna

Areas on the mother board MXCHIP recommended showed below can reduce the noise to PCB antenna and radio signal.

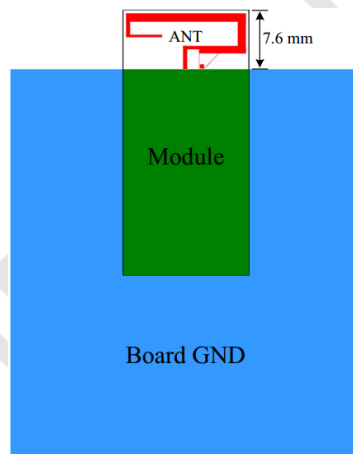


Figure 9 Module Position Recommended on Mother Board

2.5.2 T U.FL RF Connector

Make sure the connector is matched when choosing the external antenna.

Mechanical dimensions of U.FL RF connector shows as followed.

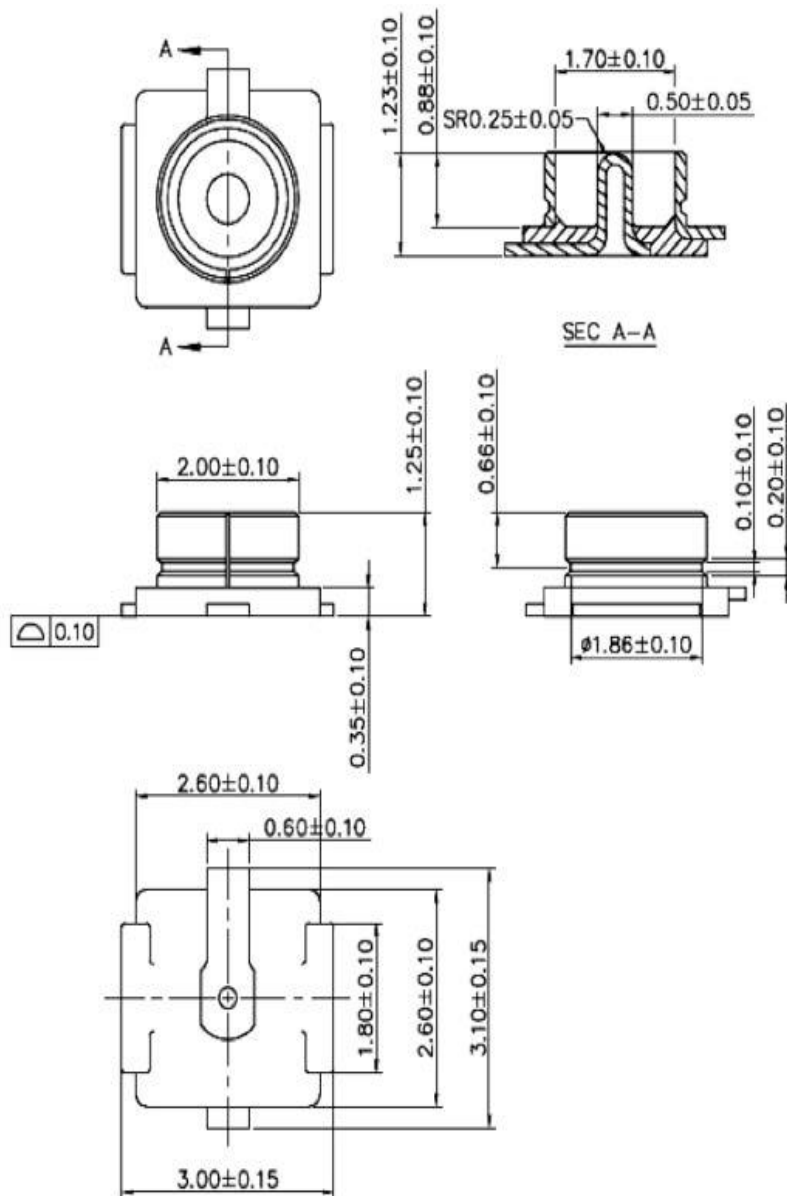


Figure 10 U.F.L Connector Size

2.6 ESD design

ESD grade of module: Human Body Model (HBM) sensitivity is 2000V, Charged Device Model (CDM) sensitivity is 500V. If a higher ESD level is required, the pins that may be connected to the outside should be reserved place for the ESD protection device.

If the module connects the mother board by outside leads, application designers should notice the EMI problems. Using shield cable or reserving the position for common mode choke to solve this problem.

3. Firmware programming and warehousing detection method

3.1 Receiving Inspection Device List

Equipment list shows below:

Table 1 Warehousing Detection Equipment List

Equipment	Quantity
PC	1 (pcs)
Fixture	1 (pcs)
EMWE-3165-A V1.0 Development Board	1 (pcs)

Application software and firmware:

FT230XS (drivers on PC), download link:

<http://www.ftdichip.com/Drivers/VCP.htm>

Programming firmware should be confirmed by both MXCHIP FAE and guests. Its size is 512kbytes.

The set of the three toggle switches on EMWE-3165-A V1.0 development board:

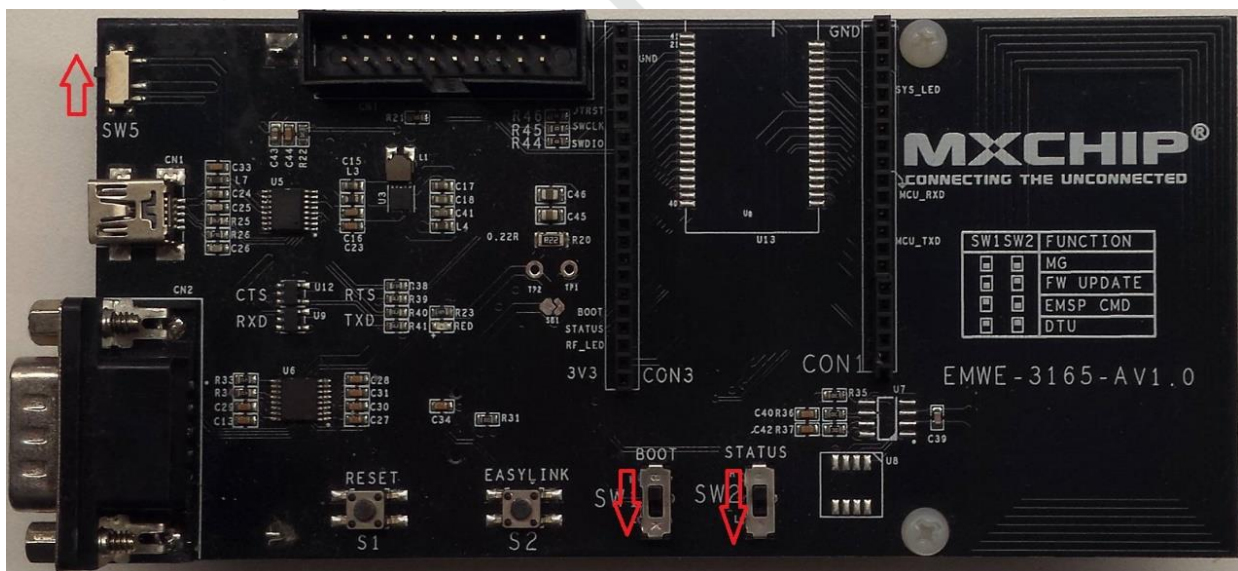


Figure 11 Development Board Switch Settings

3.2 Collection

Connect the fixture to the EMWE-3165-A V1.0 development board by the pin header. Connect the EMWE-3165-A V1.0 development board to PC by USB Mini cable.

Red led lights if connected.

3.3 Warehousing detection

3.3.1 Software setting

Software: Hyper Terminal

Find the COM number where EMW3165 connect with PC in “device manager” .

Set as followed:



Figure 12 Hyper Terminal Setting Connection

3.3.2 Module testing

Click “connect” in “Hyper Terminal” to connect the PC to EMWE-3165-A V1.0 development board.

Place the module on the fixture.



Figure 13 Place Module

Press down the handle.

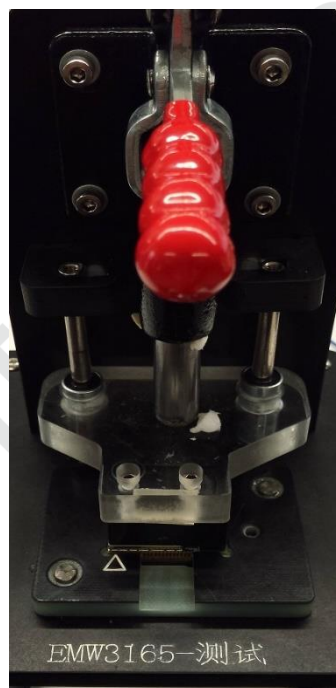


Figure 14 Press Down Handle

3.3.3 Testing result

It lists the testing result from serial on "Hyper Terminal". The message includes: bootloader version, library version, application version, driver version, MAC address, APs' name and signal strength.

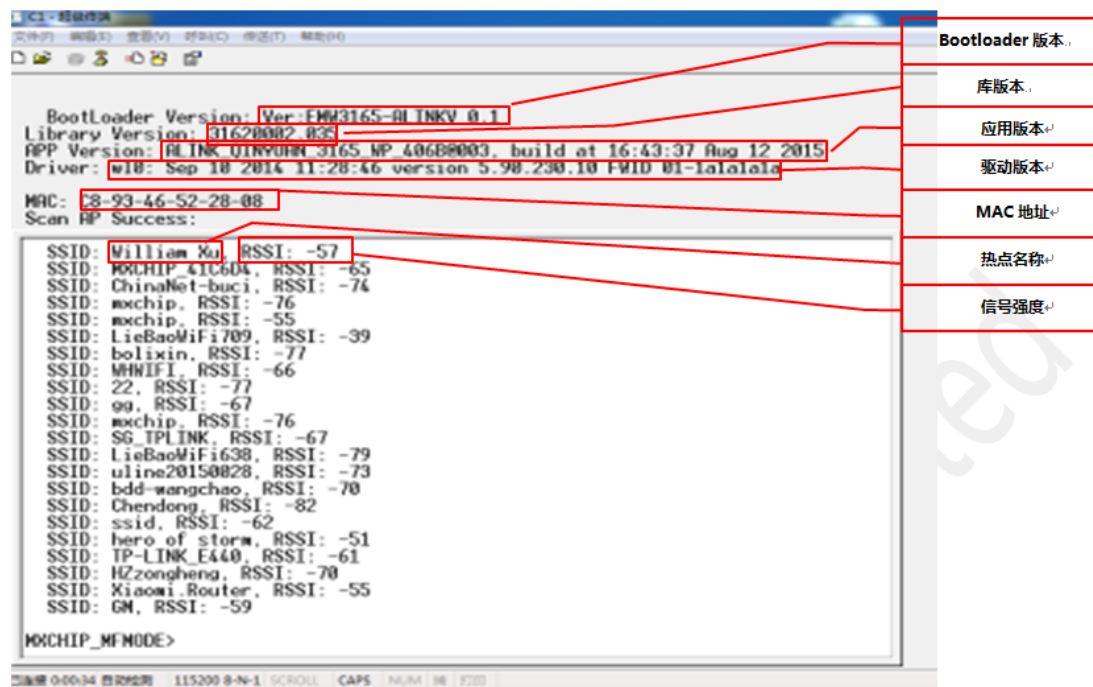


Figure 15 Testing Results

3.4 Statements

- MXCHIP has the obligation to guarantee there is no quality problem for the module delivered at each batch.
- If problems are found while sampling module, customer has the right to require MXCHIP to give a timely replacement.
- If problems are found after welding the module on mother board without any warehousing detection, MXCHIP is only responsible for the compensation of module.
- MXCHIP has the obligation to assist solving various technical problems, without retaining any MVA/BIN file of customer.
- Customer has the obligation to record every firmware version during the firmware developing work and use the proper firmware for production.

4. SMT matters

4.1 Note for stencil aperture

The recommended stencil aperture: 0.12mm (0.1~0.15mm), laser polishing hole.

The recommended solder paste is SAC305 and lead free.

The recommended extend length of welding pad: 0.15mm. It can enhance the adhesive ability of solder as shown below.

It can check the right position of the module by eyes if using SMT line without AOI testing to reduce the risk of cold solder joint.

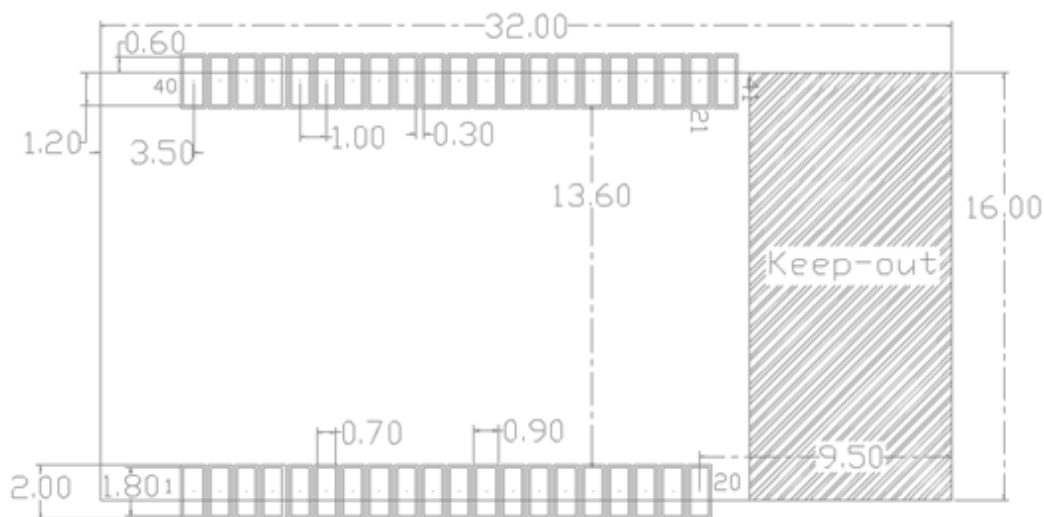


Figure 16 Recommended Stencil Aperture

4.2 Recommended reflow profile

Reflow times ≤ 2 times.

Peak temperature $< 250^{\circ}\text{C}$.

Controlling the temperature according to the temperature curve can reduce the risk of welding.

Recommended reflow profile:

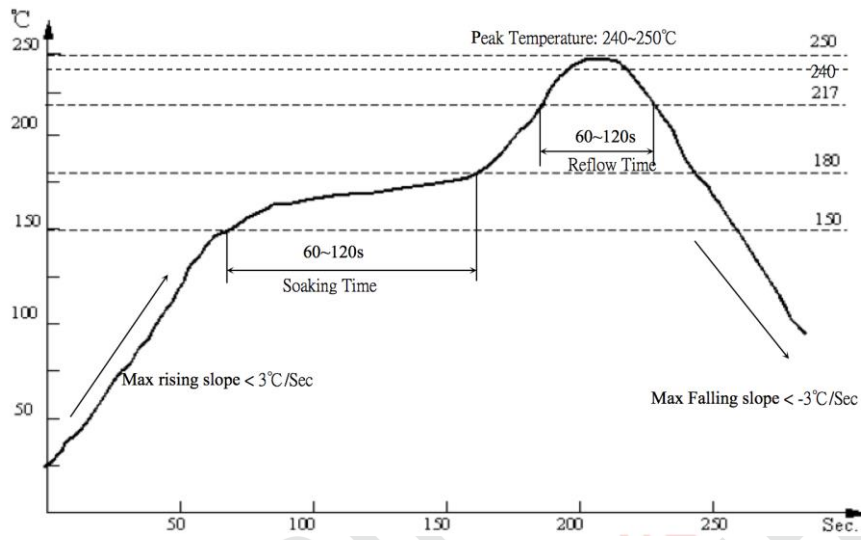


Figure 17 Reflow soldering temperature curve

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5. Mass production testing and firmware upgrading

In addition to considering the product features, application designer need to think over how to do test and upgrade firmware when developing.

5.1 Mass production test

Avoid finding problem after installing the PCB boards in machine

5.1.1 EMSP command way

Connect the module to the MCU of the mother board by serial port and use the EMSP command.

Choose one triggering way---- set one combination key, to send the test command from the MCU. The test command could be one EMSP command used to scan the APs around or connect one specified AP. The way can test both of the serial function and the RF function.

5.1.2 Limited development firmware

Connect the module to the MCU of the mother board by serial port. Add the test command in the firmware when developing. The test command could be one command from serial port used to scan the APs and return the results by serial port. The way can test both of the serial function and the RF function by using the same triggering way.

5.1.3 Full development firmware

Full development works for the whole application of the project.

Test method could be flexible in the way. It can set a specific way to test every function of the module. The application determines the specific test details.

5.2 Upgrading

Upgrading by OTA is recommended. OTA-over the air, is one wireless upgrading way.

The upgrading method is offered by MXCHIP. Several application cases are provided as referenced.

Firmware could be upgraded to the latest version by OTA with this upgrading method applied.

6. Firmware encrypt

In order to make sure the firmware could not be modified after programming in the module, firmware must be encrypted with the bootloader drivers and the chip ID MXCHIP offered.

Bootloader driver is used to drive the device in the module and integrated with one AES encryption way. The application part of the firmware must be combined with the bootloader driver to generate one MVA/bin file after adding the chip ID details which can be used to identify MXCHIP module. Check the official website for more information.

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7. Sales and technical support 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: +86-021-52655026

Address: 9th Floor, 5# building, Lane 2145, Jinshajiang Road, Putuo District, Shanghai

Post Code: 200333

Email: sales@mxchip.com

Company email: <http://www.mxchip.com>

For the latest information about products, please refer to: <http://www.mxchip.com>

Related technical support please contact:

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b. Technical support for development tools:

+86 (21) 52655026-822, Email: support@mxchip.com.