

## EMB1061 Hardware Design Guide

### Abstract

This document lists the consideration in each step during designing product with MXCHIP module. In order to achieve rapid mass production, Users should be familiar with the document to pre-consider and avoid problems effectively in designing, producing, programming and testing.

### More Help

For more products information please visit: <http://mxchip.com/>

For more development data please go to MiCO developer bbs: <http://mico.io/>

For more Fogcloud data please go to Fogcloud developer center: <http://easylink.io/>

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## Version Record

Date	Version	Details
2017-7-11	V1.0	Initial release

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## 1. Introduction

This document lists the consideration in each step during designing product with MXCHIP module. In order to achieve rapid mass production, Users should be familiar with the document to pre-consider and avoid problems effectively in designing, producing, programming and testing.

### Suitable module type:

EMB1061

### Phase to attention:

- Hardware design;
- Firmware downloading;
- Firmware testing;
- SMT;

### Top view of EMB1061



Figure 1.1. Top view of EMB1061

### EMB1061

Module type	Antenna Type	Illustration
EMB1061-P	On-board PCB	Default
EMB1061-E	IPEX	Optional

Hardware Block

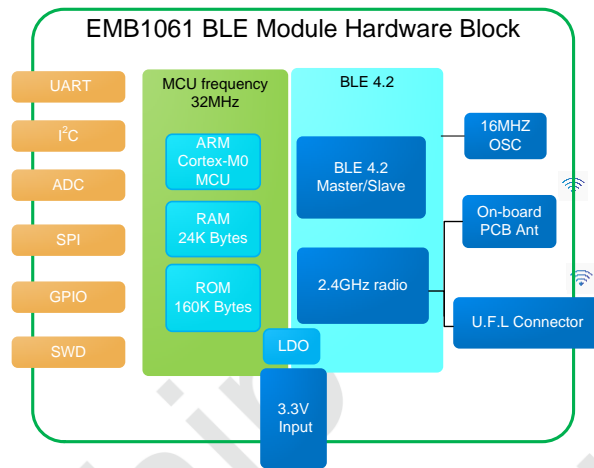


Figure 1.2 Hardware Block

## 2. Hardware Design Guide

### 2.1 Mechanical Size

Mechanical size of EMB1061 (Unit: mm)

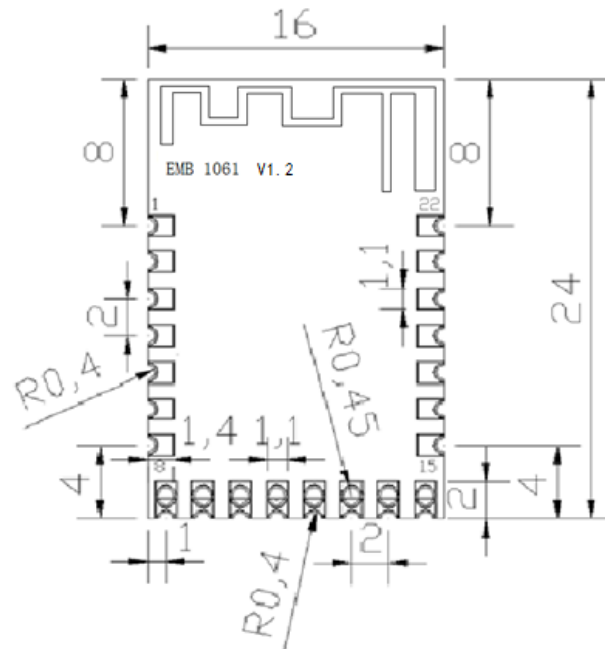


Figure 2.1 Top View of Mechanical Size (Unit:mm)

### 2.2 Reference PCB Package Design

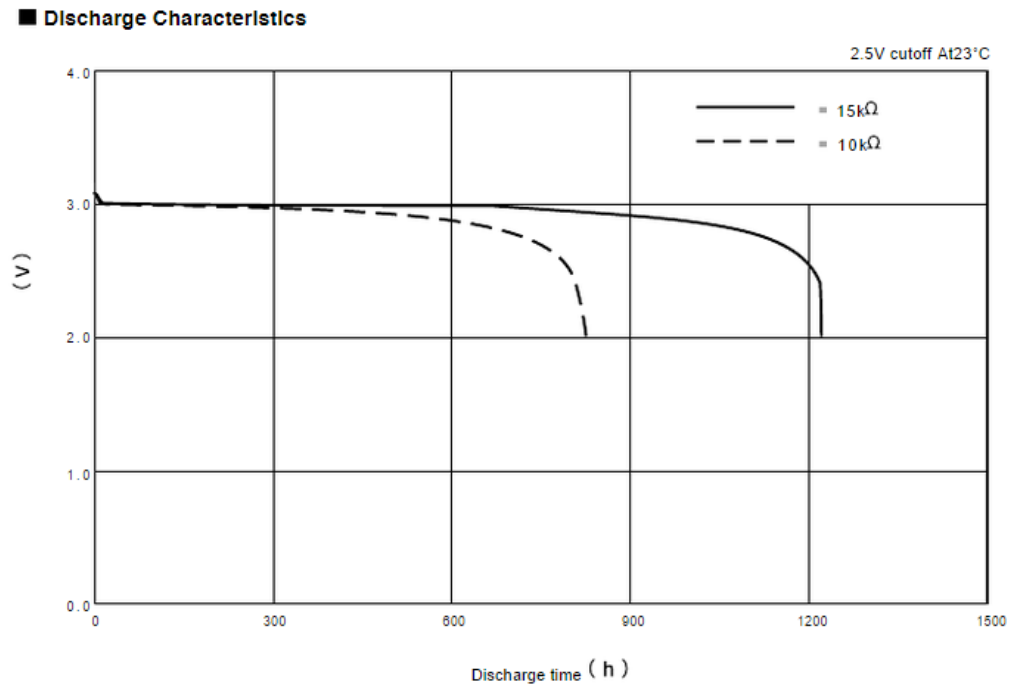
Figure 2.1 is the reference module package design for baseplate PCB design.

Solder mask openness can be the same size with EMB1061's pad. EMB1061's PCB thickness is 1.0mm.

### 2.3 DC Power Design

EMB1061's operation voltage is 1.7~3.6V with typical voltage 3.3V. The peak current of the module is about 10mA.

If powered by battery, please pay attention to the max voltage and minimal discharge voltage. For coin cell, the typical voltage is 3.0V, and the minimal discharge voltage is 2.0V, and in practice it usually end up discharging at about 2.5V. For example, CR2032 coin cell, the discharge characteristics is as below picture. When choosing battery, please check whether its discharge characteristics is suitable for EMB1061.



If using DC-DC, DC-DC's output voltage should be 3.3V, and it's max current should be above 20mA. PCB route should be particularly aware for DC/DC power supply. Compact element, excellent connection between input and output ground, long distance between feedback signal and inductance and Schottky diode are required for route. Details about the requirements should refer to the datasheet of DC/DC device.

Maximum output current and dissipate heat should be aware for the using of LDO. For example, voltage drop is 1.7V when voltage reduces from 5V to 3.3V. If the current is 100mA, power consumption is  $1.7V * 100mA = 170mW$ . Power Dissipation is a parameter of LDO, which should be over 170mW.

## 2.4 RF Design

### 2.4.1 On-board PCB Antenna Design

There should not be components, or ground, or circuit 15mm away from EMB1061's PCB antenna.



Figure 2.2 Minimum PCB Clearance Area

In order to reduce the influence from metal components to PCB antenna and wireless signal, it is better to mount EMB1061 on these areas, as shown in figure 2.3.

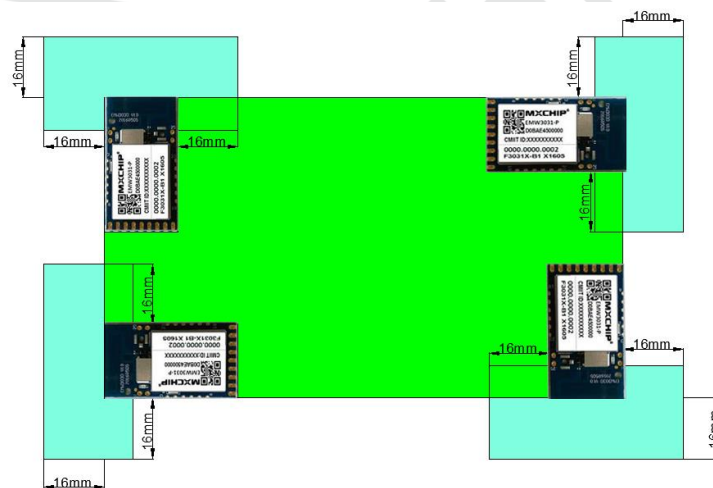


Figure 2.3 Position of the Module

### 2.4.2 External Antenna

Size of connector for external antenna is shown in figure 2.4. Make sure the correct size with suppliers before buying the connectors of antenna.



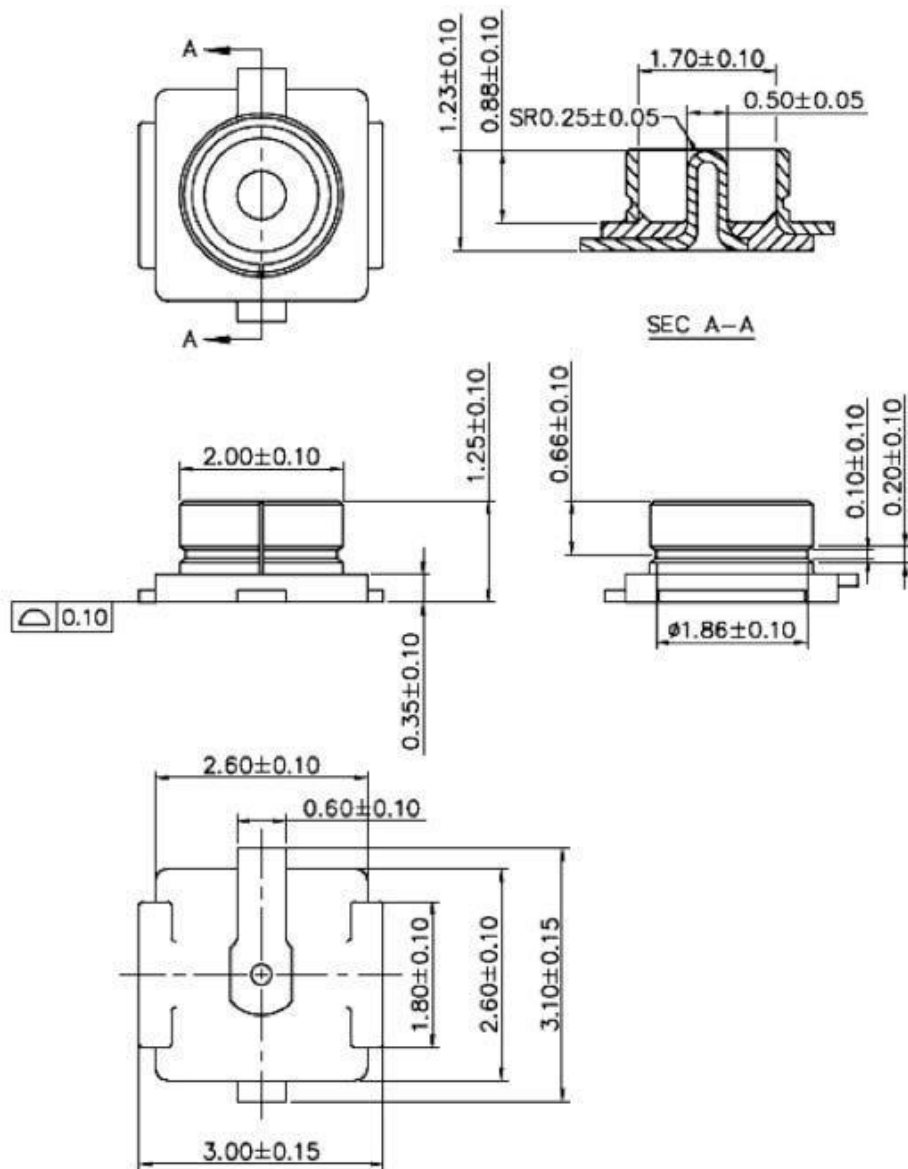


Figure 2.4 Size of connector for external antenna

## 2.5 ESD Design

ESD level of the module: Human body model (HBM) is 2000V, charged device model (CDM) is 500V. Position of ESD protected components should be reserved if the products require higher ESD requirement.

### 3. Downloading Firmware

Downloading firmware method please refer to <RM0095EN\_EMB1061 Firmware Programming Manual>.

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#### 4. Important Statement

MXCHIP has a duty to make sure there is no quality problem when sell the module to customers.

Customers have the rights to ask MXCHIP to exchange goods if the product has quality problem.

If the customer find the problem after welding the module on board without testing at the beginning, MXCHIP is only responsible for the compensation of the module part.

MXCHIP would help customers solve technical problem in developing firmware without save any MVA/bin file. Customers should save different development vision and download relative vision in module before producing.

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## 5. SMT

### 5.1 Stencils

Stencils thickness is suggested to be 0.12mm (0.1~0.15mm) with Laser grinding. Recommended solder paste: No lead SAC305.

Stencils size is shown in figure 5.1, pad holes extend 0.15mm in order to improving solder wicking. Solder mask's width should be 0.1mm wider than stencil's paste layer, like Pin1 of Figure 5.1. So that if there is no AOI testing, you can check whether the module is placed well by eye to reduce the Pseudo Soldering.

There is EMB1061's PCB lib in mxchip.com, and you can use it directly.

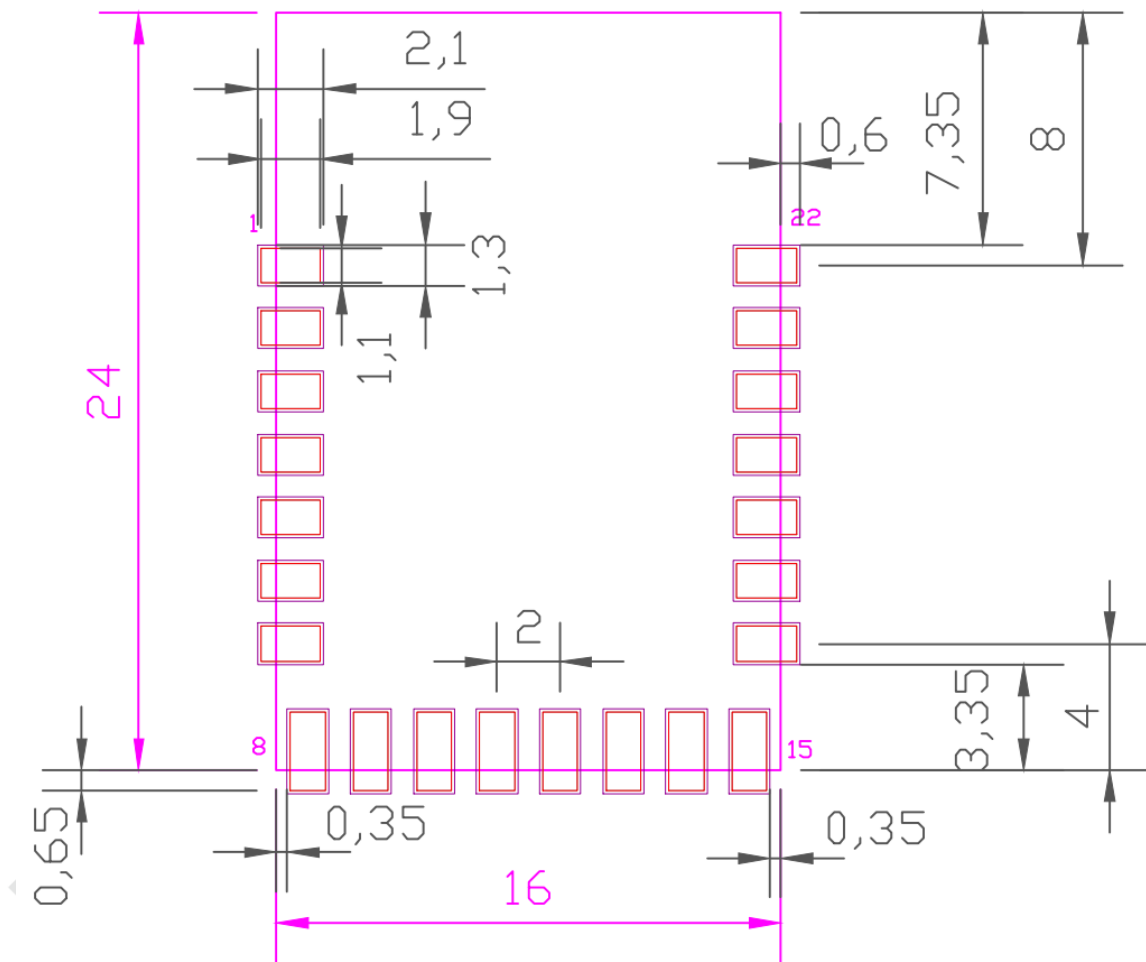


Figure 5.1 Stencils size

## 5.2 Temperature Curve of Reflow

Pseudo soldering could be reduced by control the furnace with temperature curve of secondary reflow, as shown in figure 5.2.

Secondary reflow times should be less than twice.

1. Max Rising Slope : 3 °C/sec
2. Max Falling Slope: -3 °C/sec
3. Preheat Time(150°C~200°C): 60sec~120sec
4. Over 217°C Time:40sec~70sec
5. Peak Temp.240°C~250°C

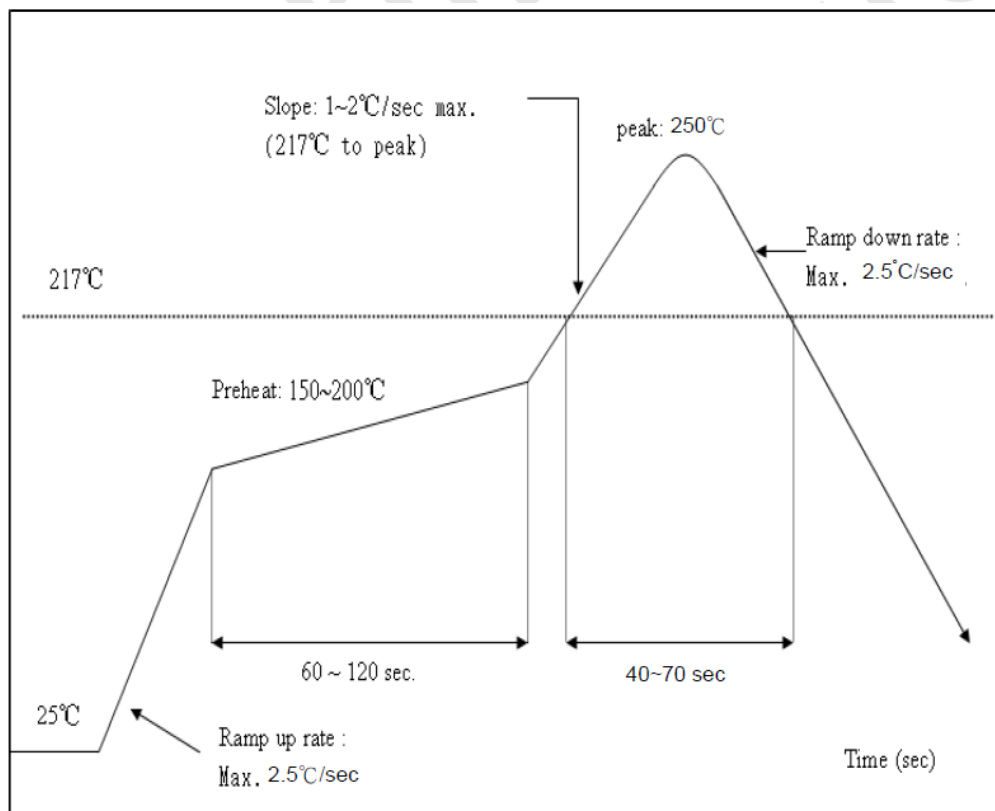


Figure 5.2 Temperature Curve of Secondary Reflow

## 6. Technical Support

For consultation or purchase the product, please contact Mxchip during working hours:

From Monday to Friday, morning 9:00~12:00, afternoon 13:00~18:00

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