JM1L2S
Hardware Specification

Edition 6

Aplix Corporation

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Preface

■ Purpose of This Document

This document describes necessary information to use the JM1L2S.

■ Notes

Contents of this document are the latest at the time of its publication, and are subject to change without notice.

Table of Contents

1. Specifications

Table 1-1 JM1L2S Specifications

Item			Contents
Bluetooth I/F	Certifications		Bluetooth® low energy technology
	Transmit power		0dBm typ.
	Receiver sensitivity		−82dBm typ.
Hardware I/F(*)	UART	Method	Asynchronous four-wire handshaking communication (TX, RX, RTS, CTS)
		Baud rate	Selectable from 2400/4800/9600/19200/31250/38400 bps
		Data length	8 bits
		Parity	Even parity, odd parity, or no parity can be configured
		Stop bit	1 bit or 2 bits can be configured
	GPIO	Input	Maximum 10 Active-High/Low can be selected Internal Pull up/Pull down resister or Open can be configured
		Output	Maximum 10 Active-High/Low can be selected
	PWM		Maximum 4 ports
Power supply	Voltage		DC 1.8 - 3.6 V
Operating conditions			Temperature: -20 - 75℃, humidity: 20 - 80% (without condensation)
External Form	Dimensions		W22×D13×H2.8mm
	Mass		Approximately 1 g

Note: Hardware I/F will be set based on the configuration

2. Electrical Characteristics

2.1 Absolute maximum ratings

Table 2-1 Ratings

Item	Value
Operating Voltage	DC 1.8 - 3.6 V
Input voltage	-0.4 - 3.6 V
Preservation temperature	-40 - 85℃

2.2 Operating Conditions

Table 2-2 Operating Conditions

Item	Value
Operating Voltage	DC 1.8 - 3.6 V
Operating environment	Temperature: -20 - 75℃, humidity: 20 - 80% (without condensation)

2.3 Power Consumption

Table 2-3 Power Consumption

Status	Power Consumption (When the operating voltage is 3V)
Sleep mode	5 uA or less
Maximum peak current	16 mA

2.4 Input-Output Terminal Characteristics

2.4.1 UART Function

The values indicated below are when the operating voltage is VIO.

Table 2-4 RX, CTS

Item	Value
Port input voltage range	-0.4 - VIO + 0.4 V
Low level	-0.4 - 0.3 × VIO V
High level	0.7 × VIO - VIO + 0.4 V

Table 2-5 TX, RTS

Item	Value
Port current	4 mA or less (recommended)
Low level	0 - 0.4 V
High level	0.75 × VIO - VIO V

2.4.2 Digital IO Function

The values indicated below are when the operating voltage is VIO.

Table 2-6 Input Port Electrical Characteristics

Item	Value
Port input voltage range	−0.4 ~ VIO + 0.4 V
Port input low level	−0.4 ~ 0.3 × VIO V
Port input high level	0.7 × VIO ~ VIO + 0.4 V

Table 2-7 Output Port Electrical Characteristics

Item	Value
Port current	4 mA or less (recommended)
Port output low level	0 ~ 0.4 V
Port output high level	0.75 × VIO ~ VIO V

2.4.3 PWM Function

The values indicated below are when the operating voltage is VIO.

Table 2-8 PWM

Item	Value
Port current	4 mA or less (recommended)
Low level	0 ~ 0.4 V
High level	0.75 × VIO ~ VIO V

2.5 Wireless Characteristics

Table 2-9 RF Characteristics Transmitter

Item	Conditions	Minimum	Standard	Maximum	Unit
Output power	Ta = -20 ~ +75℃	-4.7	0	+3	dBm
In-band Spurious emission	Frequency offset: 2 MHz Ta = -20 ~ +75℃			-20	dBm
	Frequency offset: 3 MHz or greater Ta = -20 ~ +75℃			-30	dBm
Modulation characteristics	Δf1avg	225	250	275	kHz
	Δf2max	185			kHz
Carrier frequency offset and drift	Initial frequency offset (Frequency deviation) Ta = -20 ~ +75℃	-50		+50	ppm
	Frequency drift Ta = -20 ~ +75℃	-50		+50	kHz

Table 2-10 RF Characteristics Receiver

Item	Conditions	Minimum	Standard	Maximum	Unit
Receiver sensitivity	PER < 30.8% Ta = -20 ~ +75℃		-82	-70	dBm
C/I and receiver selectivity performance	Co-Channel Interferer: -88 dBm			21	dB

Item	Conditions	Minimum	Standard	Maximum	Unit
PER < 30.8%	C/I 1 MHz Interferer: -82 dBm			15	dB
	C/I 2 MHz Interferer: -50 dBm			-17	dB
	C/I 3 MHz Interferer: -40 dBm			-27	dB
	Image frequency Interferer: -58 dBm			-9	dB
	C/I image±1 MHz Interferer: -52 dBm			-15	dB
Blocking performance	30 MHz - 2000 MHz	-30			dBm
	2003 MHz - 2399 MHz	-35			dBm
	2484 MHz - 2997 MHz	-35			dBm
	3000 MHz - 12.75 GHz	-30			dBm
Intermodulation performance	PER < 30.8% Ideal signal: -64 dBm	-50			dBm
Maximum input signal level	PER < 30.8%	-10			dBm
PER Report Integrity		50		64	%

3. Terminal Layout & Description

3.1 Terminal Layout

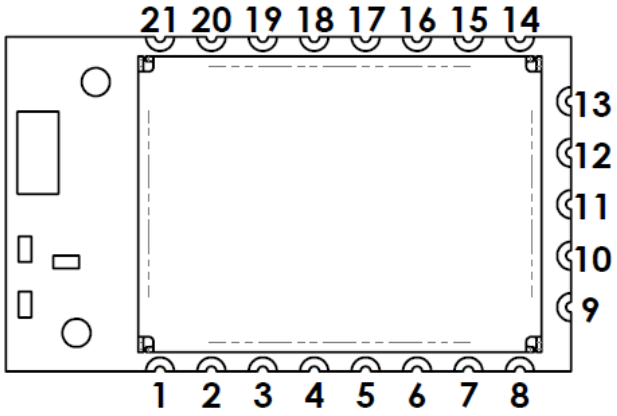


Figure 3-1 JM1L2S Terminal Layout

3.2 Terminal Description

Table 3-1 Terminal Description

PIN	Name	Description
1	GND	Ground
2	-	Reserve (do not connect)
3		
4		
5		
6	*	will be set based on the configuration
7		
8		
9		
10		
11	GND	Ground
12	*	will be set based on the configuration
13	VDD	Power supply input
14	*	will be set based on the configuration
15		
16		
17		
18		
19		
20	(WAKE)	(Option) Input to WAKE
21	GND	Ground

4. Appearance & Dimension

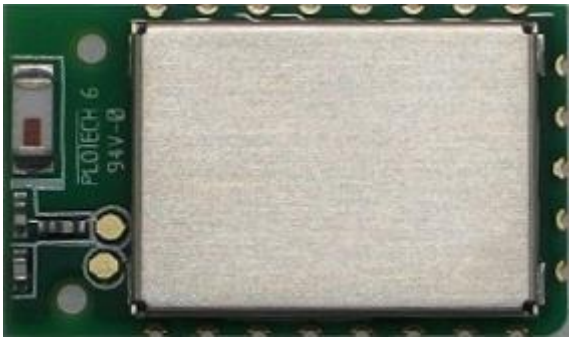


Figure 4-1 JM1L2S Appearance

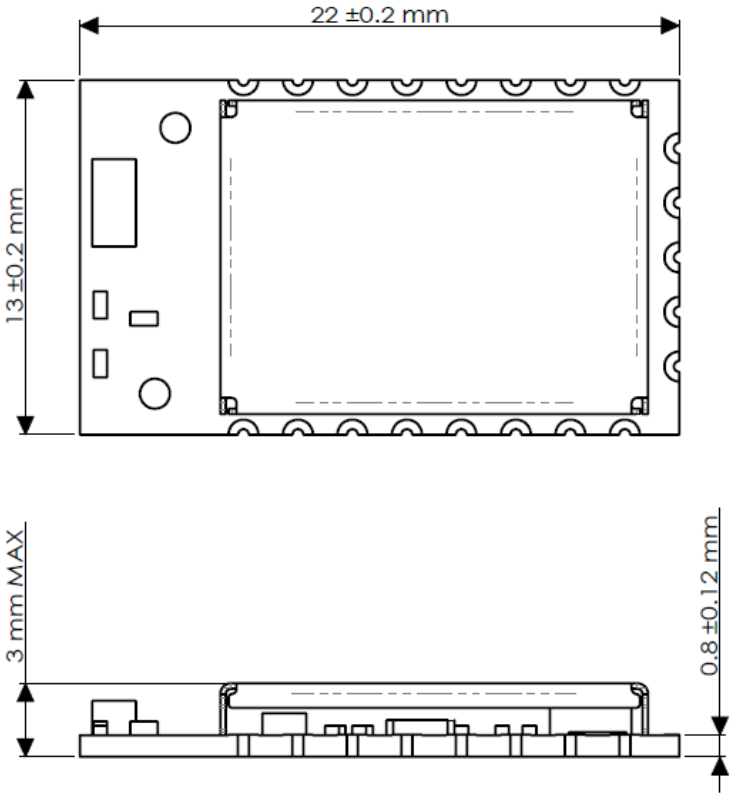
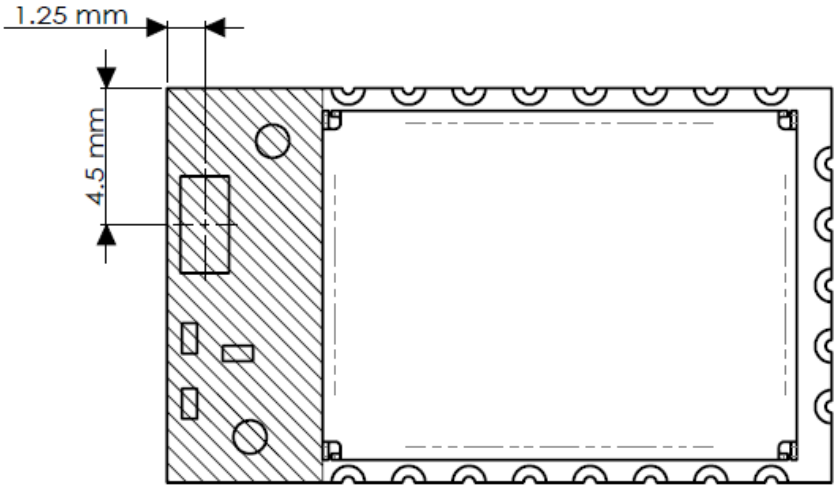


Figure 4-2 JM1L2S Dimension

5. Precaution Statements for Designing

5.1 Designing of the Circuit Board on which JM1L2S Is to Be Mounted

There is a wiring pattern on the back of the JM1L2S, so please mount it onto the surface on the circuit board where not to interfere with each other.
In addition, make sure not to impede radio wave propagation around the antenna surrounding area.



- **Figure 5-1 JM1L2S Antenna position**

5.2 Recommended Pattern

The following figure describes the recommended land and pattern dimensions to mount the JM1L2S.

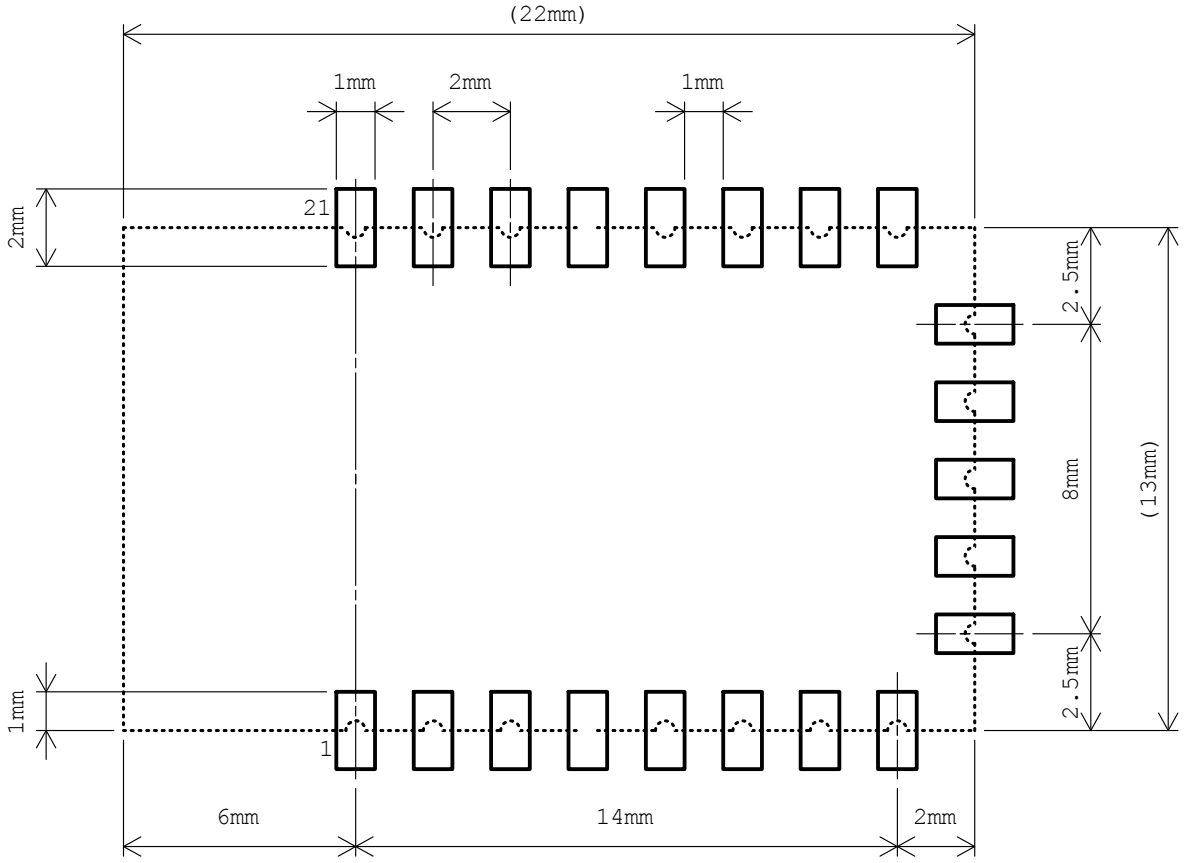


Figure 5-2 JM1L2S Recommended Pattern

The values in the above figure are ideal values with 0 tolerance.

6. Precaution Statements of Mounting

6.1 Reflow Temperature Profile

The following chart describes the reference values of the reflow temperature profile. The optimum value of the temperature profile varies depending on conditions such as the reflow furnace, solder paste, thickness of the mask, and the size of the mounting circuit board. It is recommended to perform an evaluation of the solder-mounting beforehand.

Reflow furnace: SOLSYS-6310IRTP (Manufactured by ANTOM CO., LTD.)
Soldering paste: FLF01-BZ (Manufactured by MATSUO HANDA CO., LTD.)
Mask thickness: 0.2 mm
Mounted circuit board: T = 1.6 × 28 × 30 mm, 2 layers (both-sided), FR-4

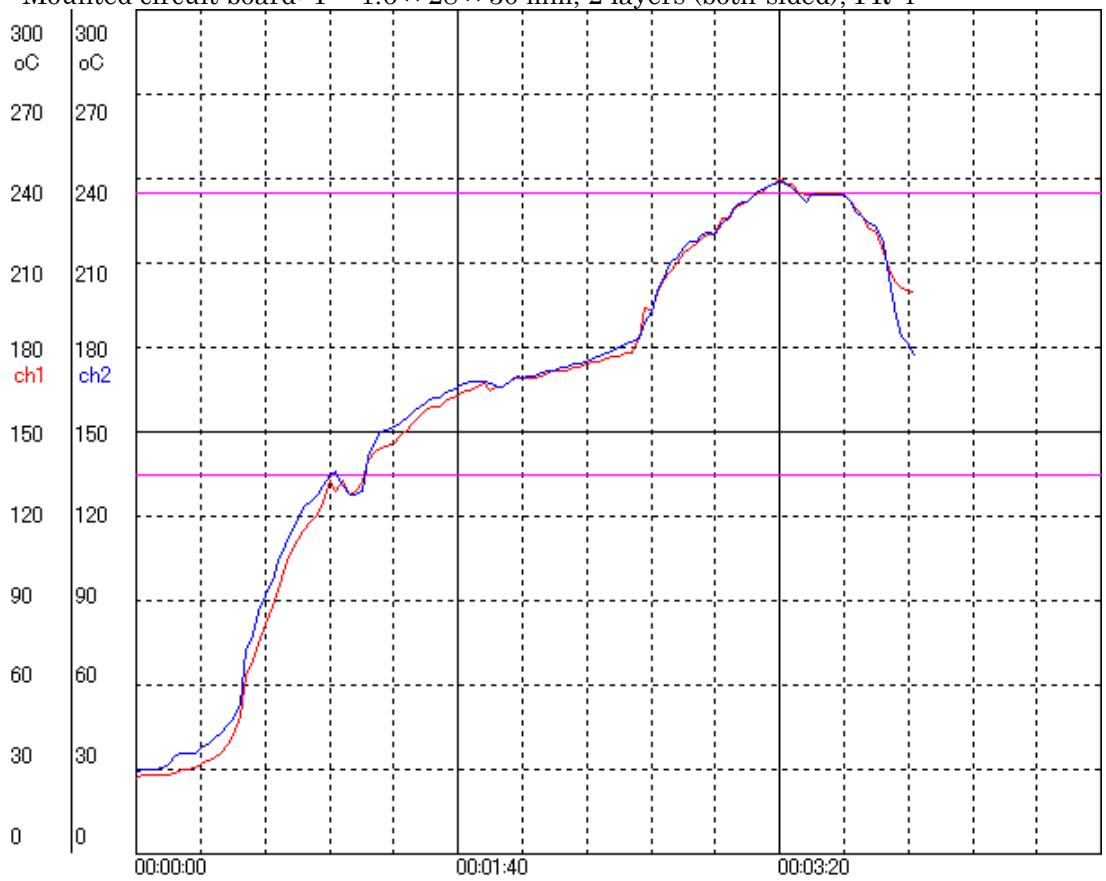


Figure 6-1 Reflow Temperature Profile (Reference values)

Note: Temperature is measured on two opposite corners (ch 1 and ch 2) of a circuit board.

■ **Configurations**

- Preheating: 175℃ ± 25℃, 60 - 150 seconds
- Practical heating: 220℃ or higher, within 60 seconds
- Peak temperature: 260℃ or lower, within 3 seconds

Perform the reflow process only once.

6.2 Conditions of the Soldering Iron

- Iron tip temperature: 350℃ or lower
- Soldering duration: 3 seconds or less
- Wattage: 20 W Max

6.3 Baking Conditions

Before JM1L2S implemented, it should be re-bake at 125℃ for 24 hours.

7. Usage notes

7.1 Storage and Use Environment

- Avoid using the module out of the operating environment range.
- Use the module in an environment which is free of oily smoke and powder dust.
- Use the module in an environment which is free of erosive gas.
- Use the module in an environment with minimum vibration and impact.
- Do not disassemble or alter this product.
- Pay due attention to static electricity.
- Pay due attention to dropping or giving impact to the product.
- Use the product within six months of its receipt. If you are going to use the product more than six months after receipt, make sure to test its solderability before use.

8. About Regulatory Compliance

This section describes the list of laws and regulations which this product is in compliance with.

Table 8-1 Laws and Regulations List

Country	Standard
Japan	Wireless facilities as prescribed in Certification Ordinance Article 2, para. 1, item 19 Certification No.:007-AB0143
USA	FCC CRF Title47 Part15 Subpart C FCC ID：O8CJM1L2S
Canada	IC RSS-210 IC ID：10551A-JM1L2S
Cambodia	Telecommunication Regulation of Cambodia TRC ID:0003 2014-1L2S
China	SRRC Certification CMIIT ID：2014DJ3646
Taiwan	LP0002(Low-power Radio-frequency Devices Technical Specifications) CCAM14LP0290T1

Bluetooth SIG

Bluetooth QD ID：54876, 46832

Environmental

RoHS Compliance

■ Notes about Laws & Regulations when developing prototypes or manufacturing final products with JM1L2S embedded

Technical Regulations Conformity Certification(Japan)

When developing prototypes or manufacturing final products with JM1L2S embedded, obtaining Technical Regulations Conformity Certification is unnecessary.

FCC/IC

When developing prototypes or manufacturing final products with JM1L2S embedded, obtaining another FCC ID or IC ID is unnecessary.

For more information, see "Appendix A Labeling requirements in the USA and Canada(FCC/IC)".

China

If you are going to ship your final product with JM1L2S embedded, the final product may need to be CCC (China Compulsory Certification) and NAL (Network Access Licence). Please consult with the certification authority.

For more information, see "Appendix B Labeling requirements in China (CMIIT)"

Taiwan

Depending on product category of your final product with JM1L2S embedded, it may need BSMI, the Bureau of Standards, Metrology, and Inspection, to perform EMC Testing. Please consult with the certification authority.

For more information, see "Appendix C Labeling requirements in Taiwan (NCC)"

Other Countries and Areas

The final product with JM1L2S may need to be certified as a final product depending on what country or area the product is shipped to. Please consult with the certification authority.

Bluetooth®

The JM1L2S has been registered on the Qualified Design Listing (QDL) based on the Bluetooth Qualification Program Reference Document (PRD) (QD ID: 54876, 46832 Company: Aplix Corporation).

If you make a self-declaration of conformity and complete product registration for your final product with JM1L2S embedded, you can display a Bluetooth logo on your product and ship it to the market.

For more information, see the following document.
https://www.bluetooth.org/en-us/Documents/Using-the-Bluetooth-Brand-Getting-Started-Guide.pdf

Description of the handling above is based on the premise that no alteration or specification change has been made to the JM1L2S. Also, for use of the product in a country which is beyond the above-mentioned laws and regulation's reach, necessary certifications must be obtained in accordance with relevant laws in the country.

9. Packing Specifications

9.1 Packing Specifications

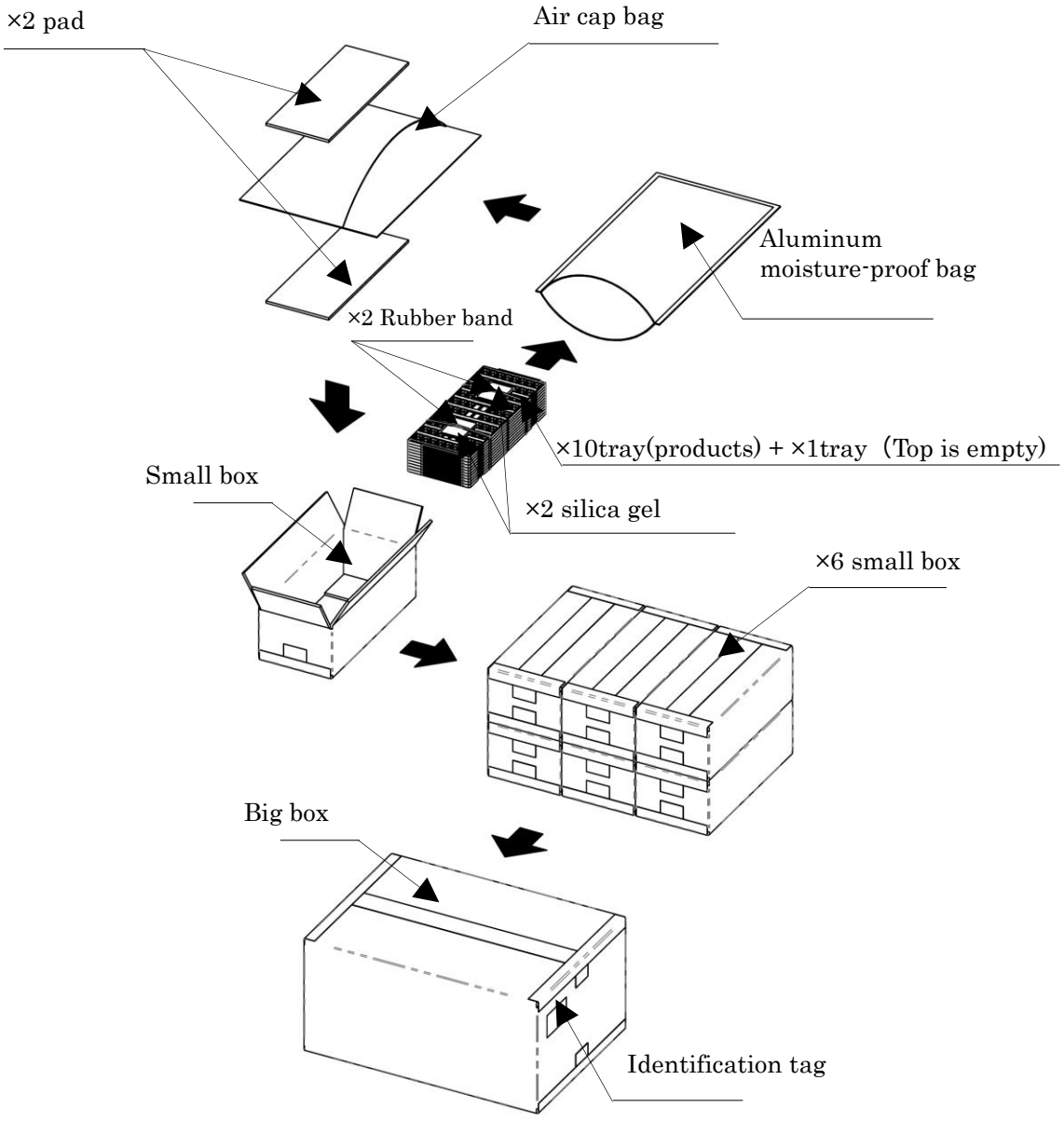


Figure 9-1 Packing structure

Table 9-1 Packing Specifications

Item	Contents
Dimensions	510 (W) × 366 (D) × 250 (H) mm (Outline of big box, Reference value)
Number of units	4800 pcs
Weight	12.8kg (modules + trays +packing materials +boxes)

9.2 Identification tag

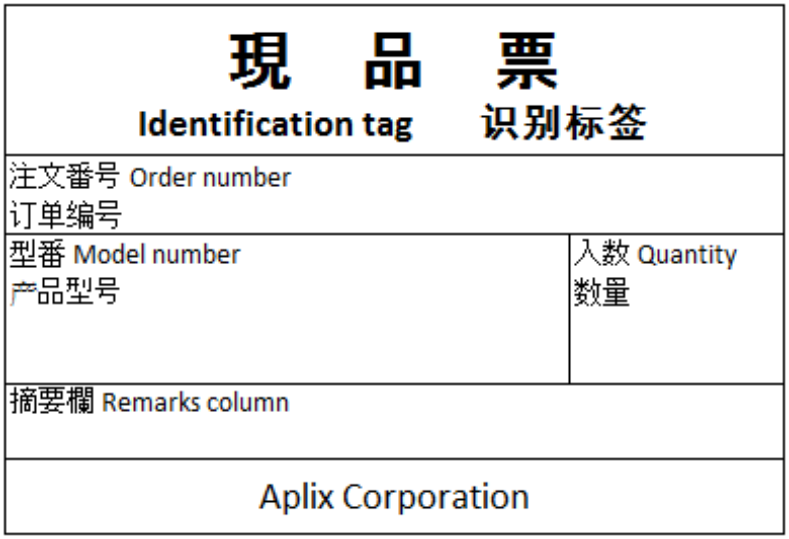


Figure 9-2 Identification tag

Appendix A Labeling requirements in the USA and Canada (FCC/IC)

If this module is embedded in a final product, it must be present on an external label placed on the final product based on the place of product delivery.

For more information, see the following official documents of the FCC and IC.

- FCC: Code of Federal Regulations, Title 47, Part 15. *RADIO FREQUENCYDEVICES*.
- IC: Radio Standards Specification. *General Requirements and Information for the Certification of Radio Apparatus*

A.1 FCC/IC ID

One or both of the FCC ID and IC ID must be present on an external label placed to the easily viewable position on the final product based on the place of product delivery. For an OEM product, one of the following two formats can be selected for the FCC and/or IC.

FCC:

- Contains Transmitter Module FCC ID: O8CJM1L2S
- Contains FCC ID: O8CJM1L2S

IC:

- Contains Transmitter Module IC: 10551A-JM1L2S
- Contains IC: 10551A-JM1L2S

A.2 FCC/IC Notice

The following statements must be specified in an easily viewable position on the product. However, if it is difficult to describe the statement because the product is small, it is also possible to describe it in the user manual of the product or package.

If the destination is in Canada, it will be required in both English and French representation.

English words

This device complies with Part 15 of FCC Rules and Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of this device.

French words

Le présent appareil est conforme aux la partie 15 des règles de la FCC et CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

A.3 FCC CAUTION

If the destination is the United States, the following statement must be included in the end user's manual of the final product.

Changes or modifications not expressly approved by the party responsible for compliance, could void the user's authority to operate the equipment.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

A.4 Radio Frequency Exposure Compliance

The following statement must be included in the end user's manual of the final product, based on the type of the product.

Mobile Device:

English words

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated keeping the radiator at least 20cm or more away from person's body (excluding extremities: hands, wrists, feet and ankles).

French words

Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles les radioélectriques (RF) de la FCC lignes directrices d'exposition et d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'IC. Cet équipement émet une énergie RF très faible qui est considérée conforme sans évaluation de l'exposition maximale autorisée. Cependant, cet équipement doit être installé et utilisé en gardant une distance de 20 cm ou plus entre le dispositif rayonnant et le corps (à l'exception des extrémités : mains, poignets, pieds et chevilles).

Portable Device:

English words

> This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low levels of RF energy that are deemed to comply without testing of specific absorption ratio (SAR).

French words:

> Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles les radioélectriques (RF) de la FCC lignes directrices d'exposition et d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'IC. Cet équipement émet une énergie RF très faible qui est considérée conforme sans évaluation du débit d'absorption spécifique (DAS).

The types of products are defined as follows:

Mobile device	Products operated in the distance more than 20 cm from person's body.
Portable device	Products operated within 20 cm from person's body.

Appendix B Labeling requirements in China (CMIIT)

B.1 Labeling requirements for the final products

Please show the following statement to the easily viewable position on the product.

本设备包含型号核准代码(分别)为: CMIIT ID: 2014DJ3646 的无线电发射模块

B.2 Labeling requirements in the user's manual

The following statement must be included in the end user's manual of the final product.

1.
- 使用频率：2.4 - 2.4835 GHz
- 等效全向辐射功率(EIRP)：
  天线增益＜10dBi 时：≤100 mW 或≤20 dBm
- 最大功率谱密度：
  天线增益＜10dBi 时：≤20 dBm / MHz(EIRP)
- 载频容限：20 ppm
- 带外发射功率(在 2.4-2.4835GHz 频段以外)
  ≤-80 dBm / Hz (EIRP)
- 杂散发射(辐射)功率(对应载波±2.5 倍信道带宽以外)：
  ≤-36 dBm / 100 kHz (30 - 1000 MHz)
  ≤-33 dBm / 100 kHz (2.4 - 2.4835 GHz)
  ≤-40 dBm / 1 MHz (3.4 - 3.53 GHz)
  ≤-40 dBm / 1 MHz (5.725 - 5.85 GHz)
  ≤-30 dBm / 1 MHz (其它 1 - 12.75 GHz)

2.不得擅自更改发射频率、加大发射功率(包括额外加装射频功率放大器)，不得擅自外接天线或改用其它发射天线；

3.使用时不得对各种合法的无线电通信业务产生有害干扰；一旦发现有干扰现象时，应立即停止使用，并采取措施消除干扰后方可继续使用；

4.使用微功率无线电设备，必须忍受各种无线电业务的干扰或工业、科学及医疗应用设备的辐射干扰；

5.不得在飞机和机场附近使用；

6.本设备包含型号核准代码(分别)为: CMIIT ID: 2014DJ3646 的无线电发射模块

Appendix C Labeling requirements in Taiwan (NCC)

C.1 Labeling requirements for the final products

Please show the following statement to the easily viewable position on the product

本產品內含射頻模組　CCAM14LP0290T1

C.2 Labeling requirements in the user's manual

The following statement must be included in the end user's manual of the final product.

第十二條

型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前項合法通信，指依電信法規定作業之無線電通信。
低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。