PRODUCT SPECIFICATION

Product Name	**AI7687H**
	MT7687 IoT SiP Module
Version	**D**
Doc No	**901-09601**
Date	**Apr 10, 2017**

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Document History

Date	Revised Contents	Revised by	Version
Jun 16th,2016	Initial Version	Kevin	A
Jul 27th,2016	Modify Pin Definition Modify Footprint Dimension Add FCC ID Add Product Making	Kevin	B
Oct 21th,2016	POD information modified Recommended PCB landing added	Chunyi	C
Apr 10th,2017	Operation temp. range modified	Chunyi	D

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1. Description

AcSiP Technology Corp. introduces a low-cost and low-power consumption IoT module. This stand-alone module is an operating system designed for wearable or internet of things (IoT) devices with smart connection and cloud application/services.

AI7687H is a highly integrated SIP module which features an application processor, a low power 1x1 11n single-band Wi-Fi subsystem, a Bluetooth subsystem, and a Power Management Unit. The application processor subsystem contains an ARM Cortex-M4F MCU, which has many peripherals, including UART, I2C, SPI, I2S, PWM, IrDA, and auxiliary ADC. AI7687H also includes embedded SRAM/ROM and a SPI 2MB serial flash.

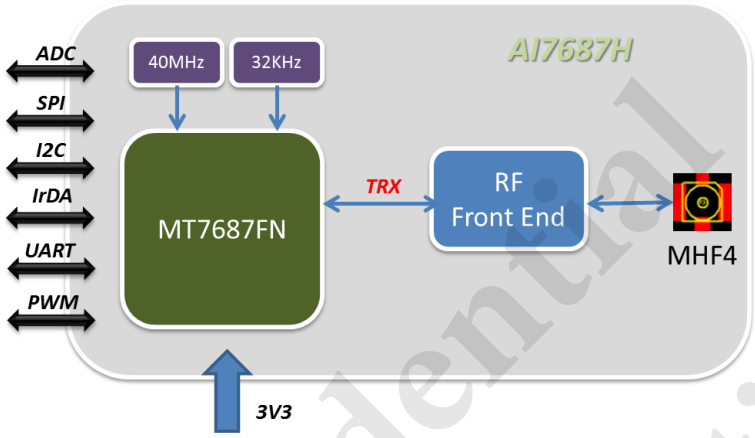
The Wi-Fi subsystem contains the 802.11b/g/n radio, baseband, and MAC that are designed to meet both the low power and high throughput application. It also contains a 32-bit RISC CPU that could fully offload the application processor.

1.1. Platform Features

General

- ARM Cortex M4 MCU with FPU with up to 192MHz clock speed
- 352KB SRAM / 64KB boot / 2MB Flash
- Supports external serial flash with Quad Peripheral Interface (QPI) mode
- Supports eXecute In Place (XIP) on flash
- 32KB cache in XIP mode
- Hardware crypto engines including AES, DES/3DES, SHA2 for network security
- Two UART interfaces with hardware flow control and one UART for debug, all multiplexed with GPIO
- One SPI slave interface multiplexed with GPIO
- Two I2C master interface multiplexed with GPIO
- One I2S interface multiplexed with GPIO
- Four channel 12-bit ADC multiplexed with GPIO
- Dedicated high-performance 32-bit RISC CPU N9 up to 160MHz clock speed
- IEEE 802.11 b/g/n compliant
- Supports 20MHz,40MHz bandwidth in 2.4GHz
- Dual-band 1T1R mode with data rate up to 150Mbps
- Supports STBC, LDPC
- Greenfield, mixed mode, legacy modes support
- IEEE 802.11 d/e/h/i/k/r/w support
- Security support for WFA WPA/WPA2 personal, WPS2.0, WAPI
- Supports 802.11w protected managed frames
- QoS support of WFA WMM, WMM PS
- Integrated LNA, PA, and T/R switch
- Optional external LNA and PA support.
- RX diversity support with additional RX input

2. Block Diagram



2.1. Specification

AI7687H	
Chipset	MT7687
Core	ARM Cortex-M4 MCU
FPU Clock Speed	192MHz
SRAM	352KB
SPI Flash	2MB
Antenna connector	MHF4 series: 20449-001E
Operation Condition	
Temperature	Operating : -40℃ ~ +85℃ Storage : -40℃ ~ +105℃
Humidity	Operating : 10 ~ 95% (Non-Condensing) Storage : 5 ~ 95% (Non-Condensing)
Mechanical Information	
Dimension	18mm X 18mm X 1.7mm (Typ.)
Package	LGA 44Pin – Stamp hole type
Certification	
FCC ID	2ADWC-AI7687H
CE	EN300328 / MPE / EN301489-1-17 / EN60950-1

3. Electrical Characteristics

3.1. Absolute Maximum Ratings

Symbol	Parameter	Min.	Typ.	Max.	Unit
VBAT	Supply Voltage	3	3.3	3.6	V
I/O Voltage	I/O supply voltage	3	3.3	3.6	V

3.2. RF Characteristics

3.2.1. RF Characteristics for 802.11b 11M

802.11b Transmit (Conductive)					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		Channel 1		Channel 13	
Tx Power Level	DQPSK	18.0	20.0	22.0	dBm
Frequency Tolerance		-15	0	15	ppm
Spectral Mask	11MHz→22MHz		40		dBr
	＞22MHz		53		dBr
Modulation Accuracy	All Data Rate		15		%
802.11b Receiver (Conductive)					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		Channel 1		Channel 13	
Min. Input	11Mbps PER<8%	-90	-88	-86	dBm

3.2.2. RF Characteristics for 802.11g 54M

802.11g Transmit (Conductive)					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		Channel 1		Channel 13	
Tx Power Level	OFDM	15.0	17.0	19.0	dBm
Frequency Tolerance		-15	0	15	ppm
Modulation Accuracy	All data rate		-31	-28	
802.11g Receiver (Conductive)					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		Channel 1		Channel 13	
Min. Input	54Mbps PER<10%	-77.0	-75.0	-73.0	

3.2.3. RF Characteristics for 802.11n MCS7(HT20)

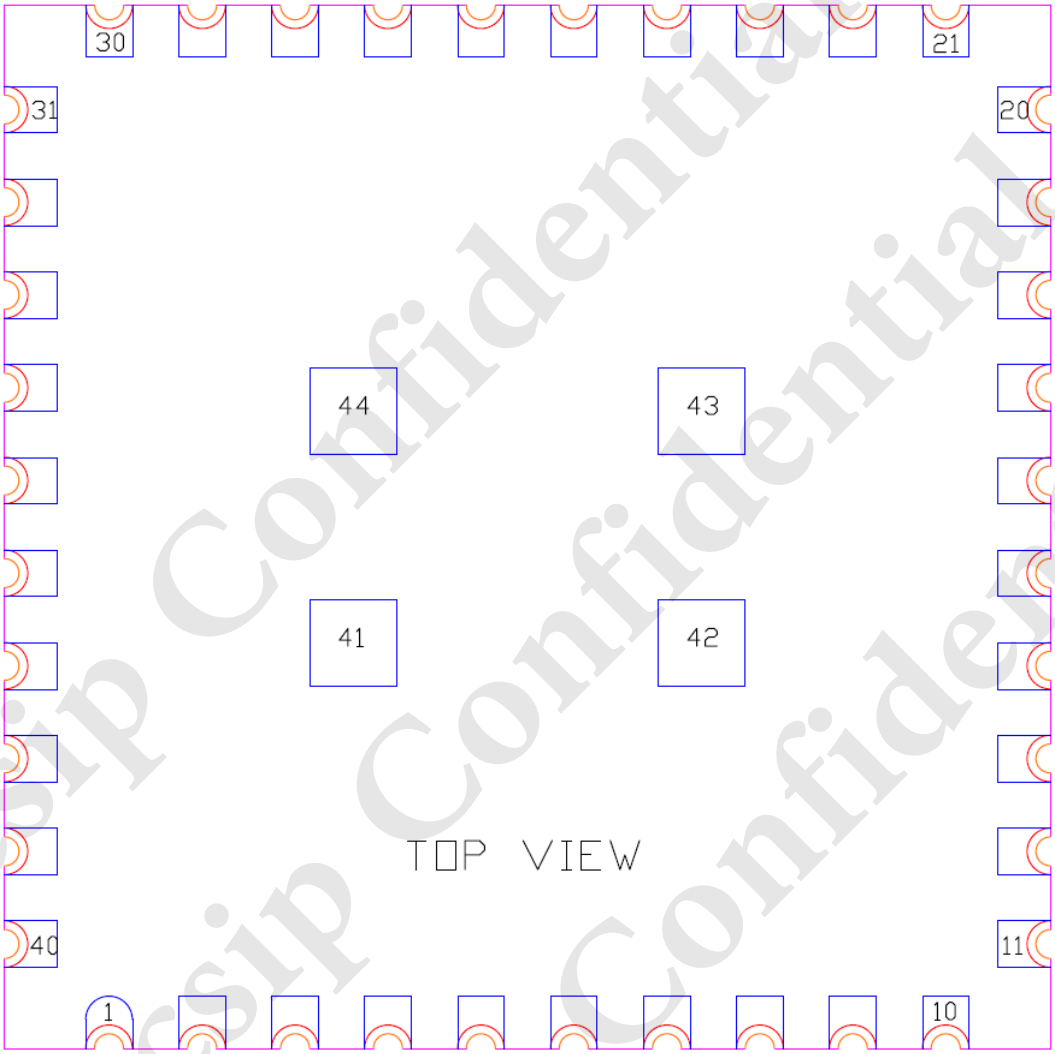
802.11n_HT20 Transmit (Conductive)					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency range		Channel 1		Channel 13	
Tx Power Level	OFDM	15.0	17.0	19.0	dBm
Frequency Tolerance		-15	0	15	ppm
Modulation Accuracy	All Data Rate		-31	-28	dB
802.11n_HT20 Receiver (Conductive)					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		Channel 1		Channel 13	
Min. Input	MCS7 PER<10%	-75	-73	-71	dBm

3.2.4. RF Characteristics for 802.11n MCS7(HT40)

802.11n_HT40 Transmit (Conductive)					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency range		Channel 1		Channel 13	
Tx Power Level	OFDM	15.0	17.0	19.0	dBm
Frequency Tolerance		-15	0	15	ppm
Modulation Accuracy	All Data Rate		-30	-28	dB
802.11n_HT40 Receiver (Conductive)					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		Channel 1		Channel 13	
Min. Input	MCS7 PER<10%	-73.5	-71.5	-69.5	dBm

4. Pin Definition

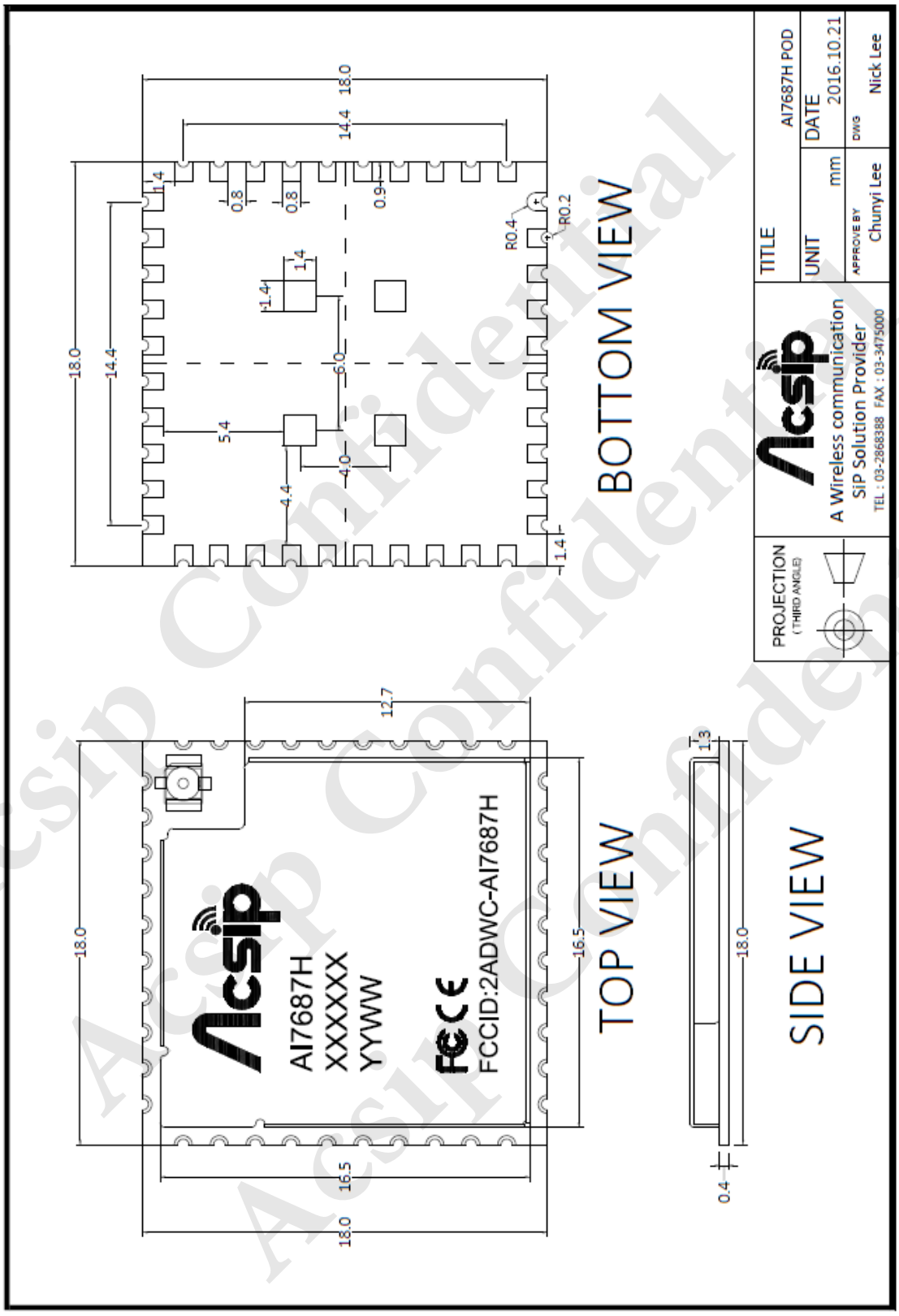
4.1. Detailed Pin Description



PIN no.	Pin Name	PIN no.	Pin Name
1	GPIO29	23	GPIO0
2	GPIO30	24	GPIO1
3	GPIO28	25	GPIO2
4	GPIO27	26	GPIO3
5	PMU_EN_WF	27	GPIO6
6	GPIO60	28	GPIO7
7	GPIO59	29	GPIO5
8	GPIO58	30	GPIO24
9	GPIO57	31	GPIO25
10	GPIO39	32	GPIO26
11	SYS_RST_N	33	GPIO4
12	GPIO38	34	RTC_3V3
13	GPIO37	35	GND
14	3V3	36	PMU_EN_RTC
15	GPIO36	37	GPIO32
16	GPIO35	38	GPIO31
17	GPIO34	39	3V3
18	GPIO33	40	GND
19	GND	41	Thermal GND
20	NC	42	Thermal GND
21	GND	43	Thermal GND
22	GND	44	Thermal GND

* Please refer to “AI76x7H series PINMUX Table.pdf” file for more info. about pin configuration.

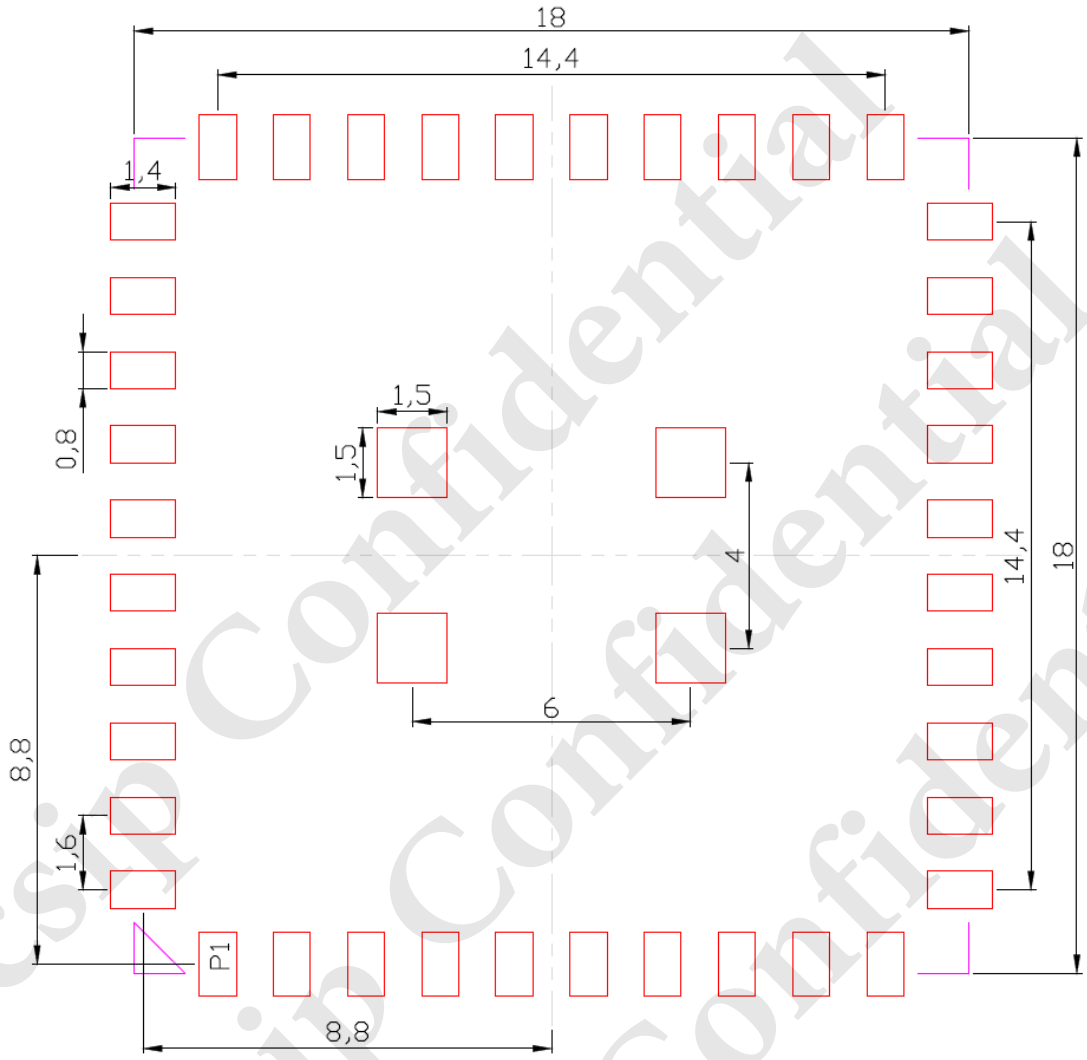
4.2. AI7687H POD Information



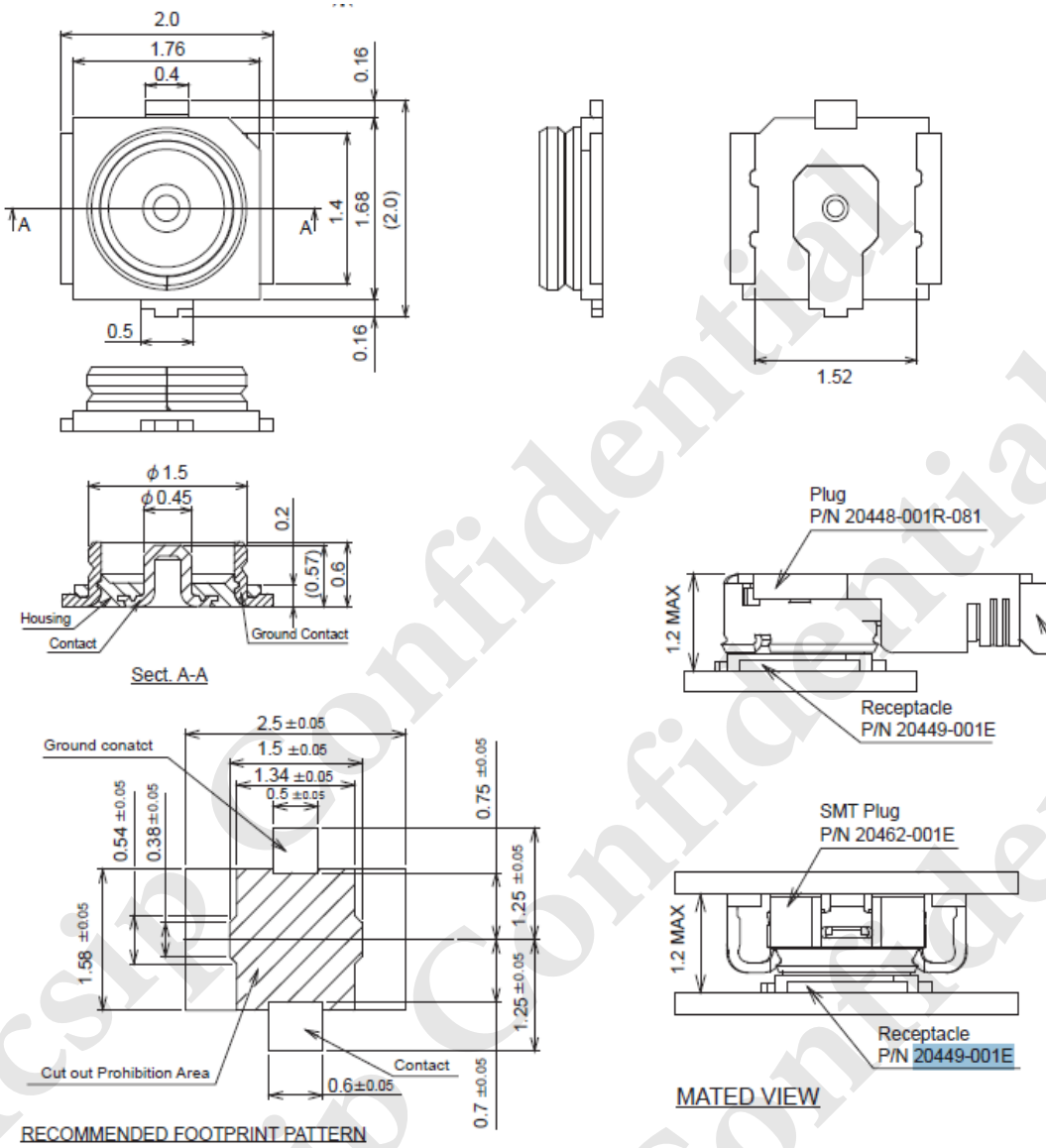
4.3. Recommended PCB Landing

UNIT：mm

TOPVIEW



4.4. Antenna Connector Dimension

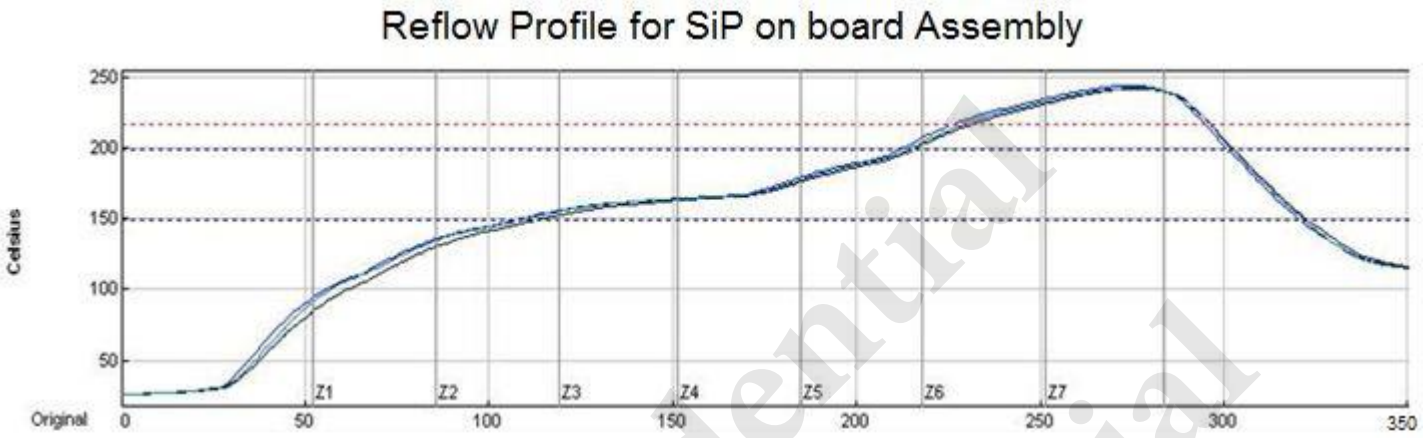


5. Regulator

This SiP module is passed on module level to comply with following standards:

- FCC ID：2ADWC-AI7687H
- CE：EN300328 / MPE / EN301489-1-17 / EN60950-1

6. Recommended Reflow Profile



Preheat time	150℃—200℃: 105+/-15sec
Dwell time	Over 220℃: 70+5/-10 sec
Peak Temp	240 +10/-5℃
Ramp Up/Down Rate	Up: 3 +0/-2 ℃/ sec Down: 2 +0/-1℃/ sec

7.SiP Module Preparation

7.1. Handling

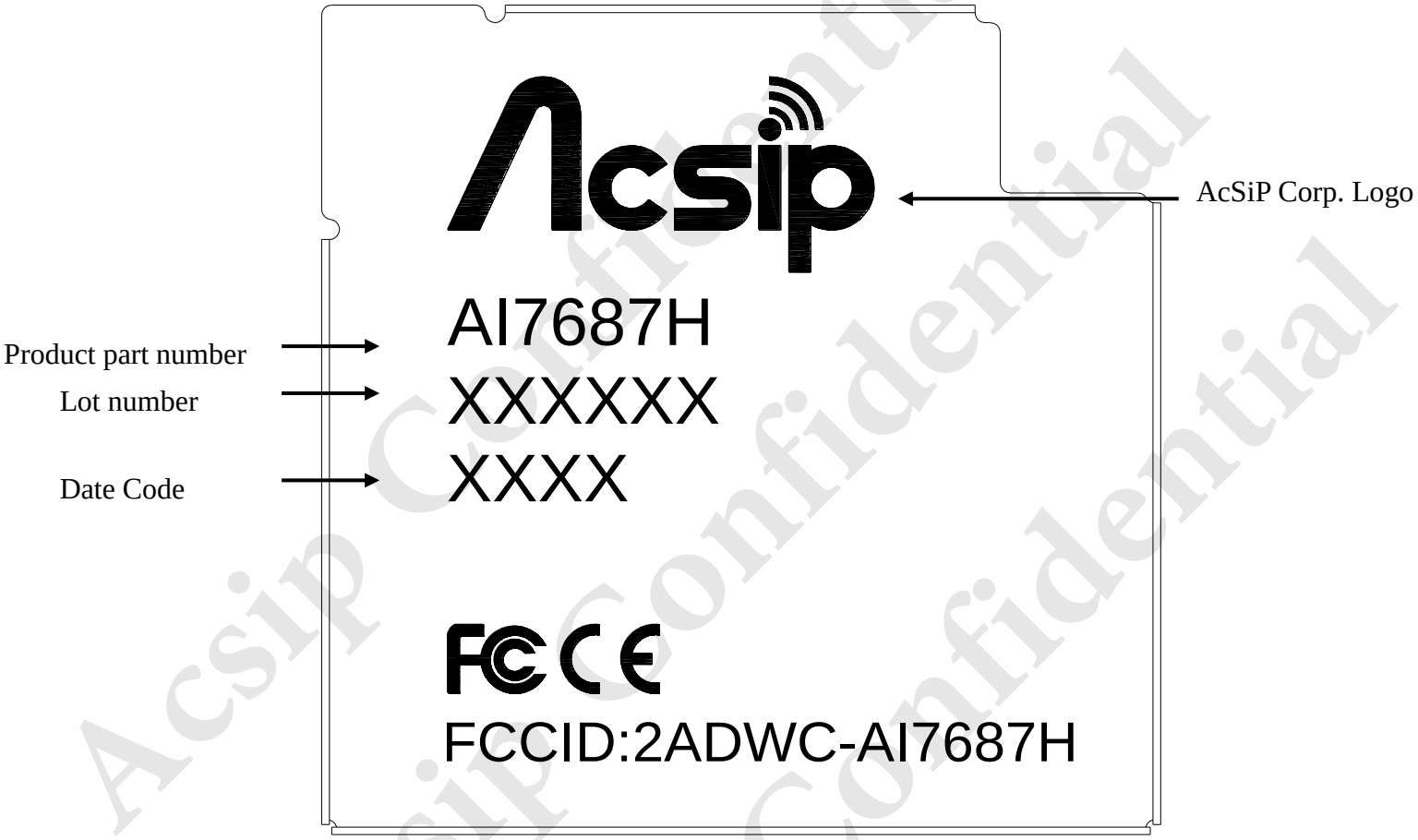
Handling the module must wear the anti-static wrist strap to avoid ESD damage. After each module is aligned and tested, it should be transport and storage with anti -static tray and packing. This protective package must be remained in suitable environment until the module is assembled and soldered onto the main board.

7.2. SMT Preparation

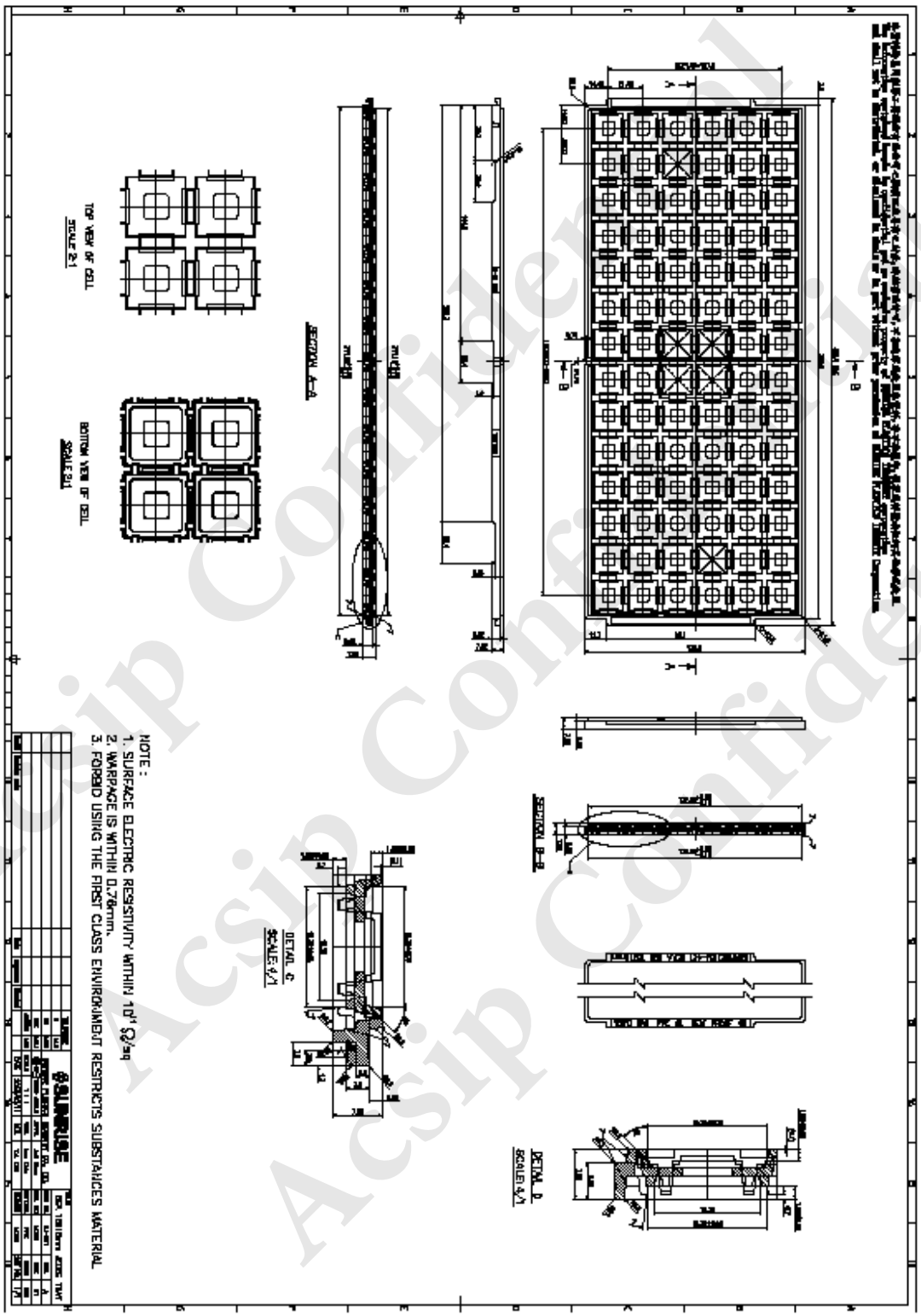
1. Calculated shelf life in sealed bag: 6 months at<40℃ and <90% relative humidity (RH).
2. Peak package body temperature: 250℃.
3. After bag was opened, devices that will be subjected to reflow solder or other high temperature process must.
   A. Mounted within: 168 hours of factory conditions<30℃/60%RH.
   B. Stored at≦10%RH with N2 flow box.
4. Devices require baking, before mounting, if:
   A. Package bag does not keep in vacuumed while first time open.
   B. Humidity Indicator Card is >10% when read at 23±5℃.
   C. Expose at 3A condition over 8 hours or Expose at 3B condition over 24 hours.
5. If baking is required, devices may be baked for 12 hours at 125±5℃.

8. Package Information

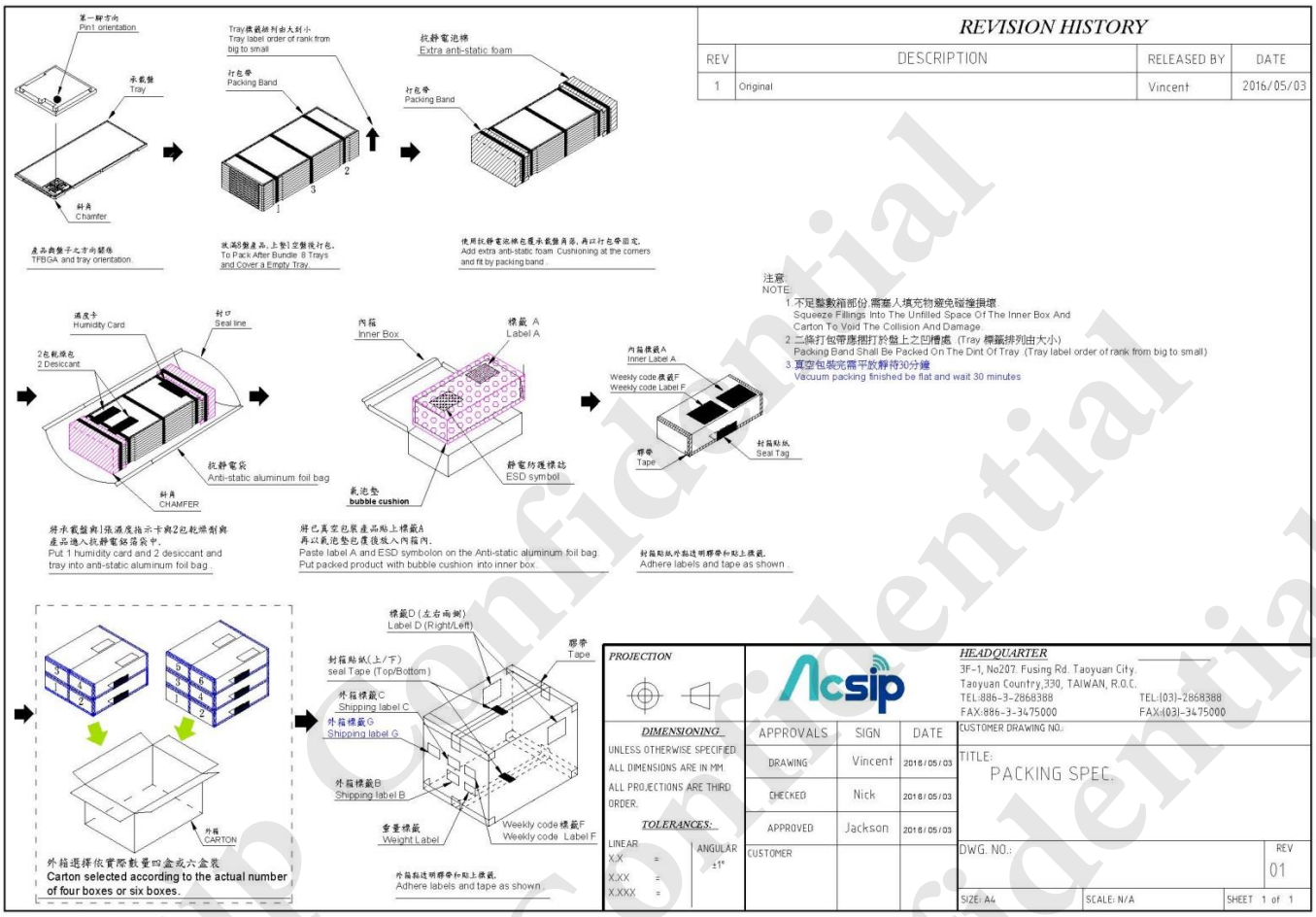
8.1. Product Making



8.2. Tray Dimension



8.3. Packing Information



8.4. Humidity Indicator Card

Dry **Wet**

Indicates 指示點:
10%,20%,30,40%,50%,60% relative humidity
10%,20%,30,40%,50%,60% 相對濕度

Color Change 顏色變化:
Brown (Dry) ---> Blue (Wet)
棕色 (乾燥) ---> 藍色 (潮溼)