PRODUCT SPECIFICATION

Product Name	**AI7688H**
	MT7688 IoT SiP Module
Version	**D**
Doc No	**901-09003**
Date	**Nov 11, 2016**

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Document History

Date	Revised Contents	Revised by	Version
Apr 07th,2016	Initial Version	Kevin	A
Apr 29th,2016	Modify PIN Description	Kevin	B
	Modify Tray Dimension		
	Add FCCID Number		
May 4th,2016	Modify Packing Information	Huiju	B01
Aug 18th,2016	Modify Specification	Kevin	C
Nov 11th,2016	Add SPI Pin Out	Kevin	D
	Modify AI7688H Footprint Dimension		

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1. Description

AcSiP Technology Corp. introduces a low-cost and low-power consumption IoT module. The module is an operating system designed for Wearables and Internet of Things (IoT) devices that can connect to other smart devices or directly to cloud applications and services.

AI7688H is one of the most highly integrated SIP module for IoT prototyping

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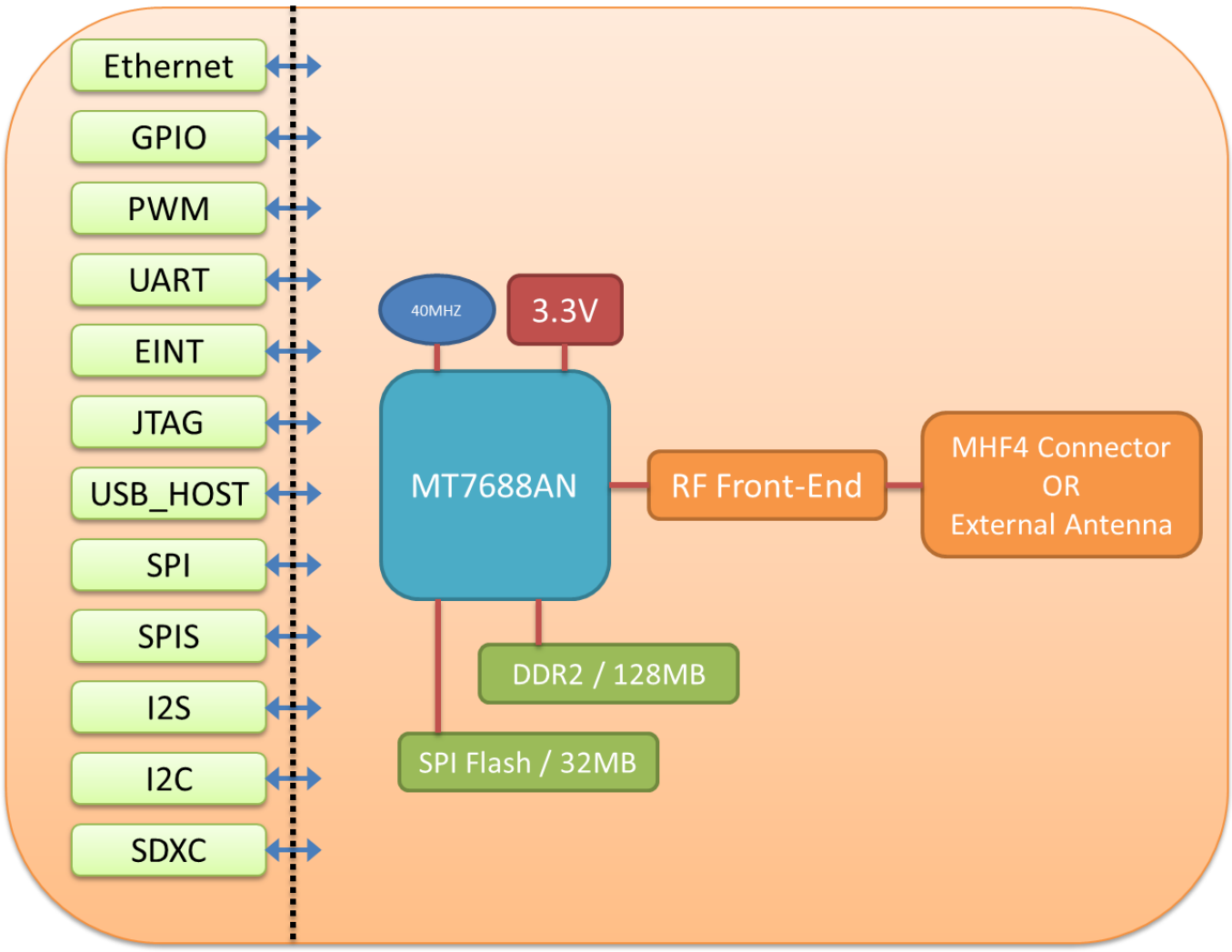
1.1. Platform Features

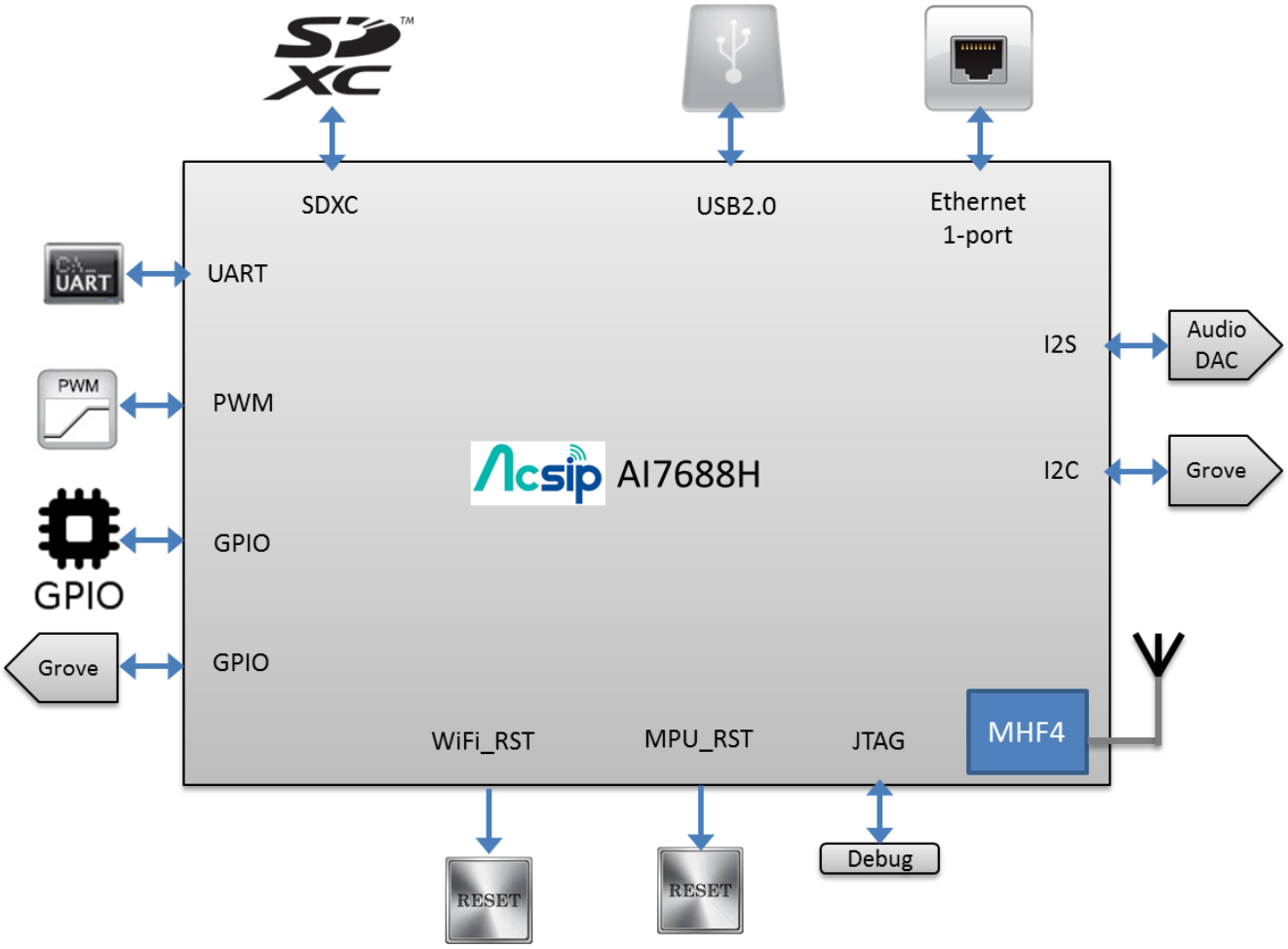
General

- Embedded MIPS24KEc (575/580 MHz) with 64 KB I-Cache and 32 KB D-Cache
- 1T1R 2.4 GHz with 150 Mbps PHY data rate
- Legacy 802.11b/g and HT 802.11n modes
- 20/40 MHz channel bandwidth
- 802.11v
- Green AP/STA − Intelligent Clock Scaling (exclusive) − DDRII: ODT off, Self-refresh mode
- 1-port 10/100 FE PHY
- x1 USB 2.0 Host,
- SPI/SD-XC/eMMC
- SPI,I2C, I2S,PCM, UART, JTAG, GPIO
- Internet Of Thing
- An optimized PMU
- 16 Multiple BSSID
- WEP64/128, TKIP, AES, WPA, WPA2, WAPI
- QoS: WMM, WMM-PS
- AP/STA Fi mware: Linux 2.6.36 SDK, OpenWrt

2. Block Diagram



2.1. Typical application



2.2. Specification

Model Name	AI7688H
Chipset	MT7688AN
Core	MIPS24KEc
Clock Speed	580MHz
Memory	DDR2 128MB
Flash	32MB
Operation Conditions	
Temperature	Operating : -40℃ ~ +85℃ Storage : -40℃ ~ +85℃
Humidity	Operating : 10 ~ 95% (Non-Condensing) Storage : 5 ~ 95% (Non-Condensing)
Dimension	24mm X 32mm X1.8mm (Typ.)
Package	LGA 65Pin

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

Test Condition：

Temperature	**26.8°C**
Humidity	**30%**

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%	-91.5	-89.5	-87.5	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%	-78.0	-76.0	-74.0	

3.2.3. RF Characteristics for 802.11n MCS7(HT20)

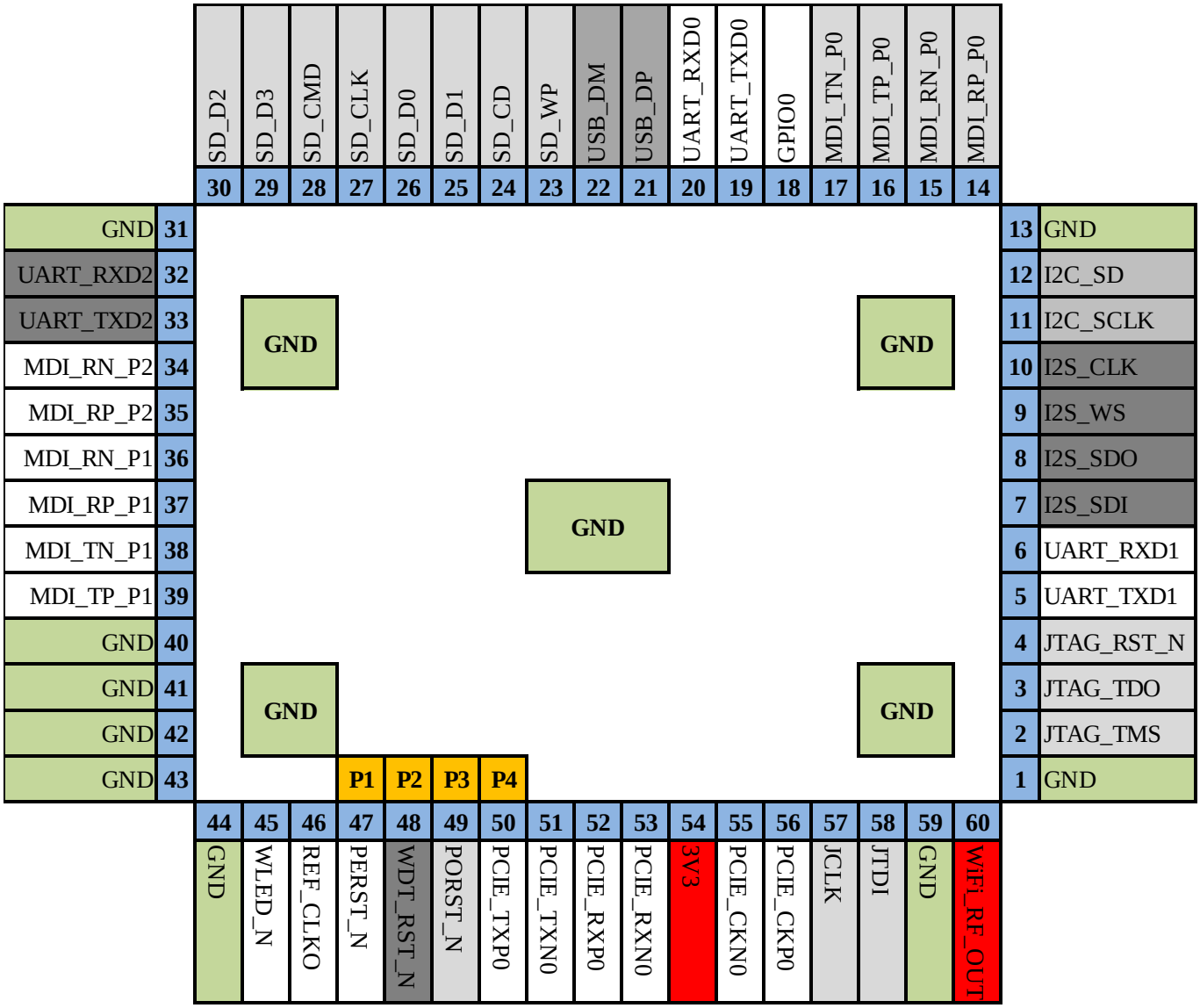
802.11n_HT20 Transmit (Conductive)					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency range		Channel 1		Channel 13	
Tx Power Level	OFDM	15.0	17.0	19.0	dBm
Frequency Tolerance		-15	0	15	ppm
Modulation Accuracy	All Data Rate		-31	-28	dB
802.11n_HT20 Receiver (Conductive)					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		Channel 1		Channel 13	
Min. Input	MCS7 PER<10%	-76.5	-74.5	-72.5	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		-31	-28	dB
802.11n_HT40 Receiver (Conductive)					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Frequency Range		Channel 1		Channel 13	
Min. Input	MCS7 PER<10%	-76.5	-74.5	-72.5	dBm

4. Pin Definition

4.1. Detailed Pin Description



Module_pinout	Pin NAME	DIGITAL Pin	SERIAL Pin	Other
1	GND			
2	JTAG_TMS			
3	JTAG_TDO	GPIO 43	EPHY LED	
4	JTAG_RST_N			
5	UART_TXD1	GPIO 45	UART_TXD1	
6	UART_RXD1	GPIO 46	UART_RXD1	
7	I2S_SDI	GPIO 0	I2S_SDI	
8	I2S_SDO	GPIO 1	I2S_SDO	
9	I2S_WS	GPIO 2	I2S_WS	
10	I2S_CLK	GPIO 3	I2S_CLK	
11	I2C_SCLK	GPIO 4	I2C SCL	
12	I2C_SD	GPIO 5	I2C SDA	
13	GND			
14	MDI_RP_P0		ETHY RD+	
15	MDI_RN_P0		ETHY RD-	
16	MDI_TP_P0		ETHY TD+	
17	MDI_TN_P0		ETHY TD-	
18	GPIO0			
19	UART_TXD0	GPIO 12	UART_TXD0	
20	UART_RXD0	GPIO 13	UART_RXD0	
21	USB_DP		USB D+	
22	USB_DM		USB D-	
23	SD_WP			
24	SD_CD			
25	SD_D1			
26	SD_D0			
27	SD_CLK			
28	SD_CMD			
29	SD_D3			
30	SD_D2			

Module_pinout	Pin NAME	DIGITAL Pin	SERIAL Pin	Other
31	GND			
32	UART_RXD2	GPIO 21	UART_RXD2	PWM2
33	UART_TXD2	GPIO 20	UART_TXD2	PWM3
34	MDI_RN_P2	GPIO 19		
35	MDI_RP_P2	GPIO 18		PWM0
36	MDI_RN_P1	GPIO 17		PWM1
37	MDI_RP_P1	GPIO 16		
38	MDI_TN_P1	GPIO 15		
39	MDI_TP_P1	GIPO 14		
40	GND			
41	GND			
42	GND			
43	GND			
44	GND			
45	WLED_N			Wi-Fi LED
46	REF_CLKO	GPIO 37		REF_CLK
47	PERST_N			
48	WDT_RST_N			WiFi RESET
49	PORST_N			MPU RESET
50	PCIE_TXP0			
51	PCIE_TXN0			
52	PCIE_RXP0			
53	PCIE_RXN0			
54	3v3			
55	PCIE_CKN0			
56	PCIE_CKP0			
57	JCLK			
58	JTDI			
59	GND			
60	2.4G_RF			
P1 *	SPI_CLK	GPIO7	SPI_CLK	
P2 *	SPI_MOSI	GPIO8	SPI_MOSI	
P3 *	SPI_MISO	GPIO9	SPI_MISO	

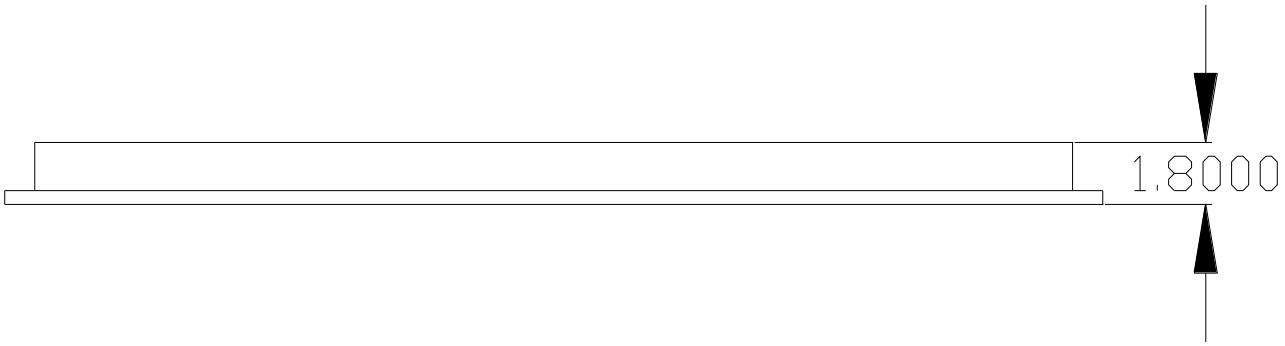
P4	*	SPI_CS1	GPIO6	SPI_CS1	

***IF P1、P2、P3、P4 are not used, please do not connect them (DNC)**

4.2. AI7688H Dimension

UNIT： mm

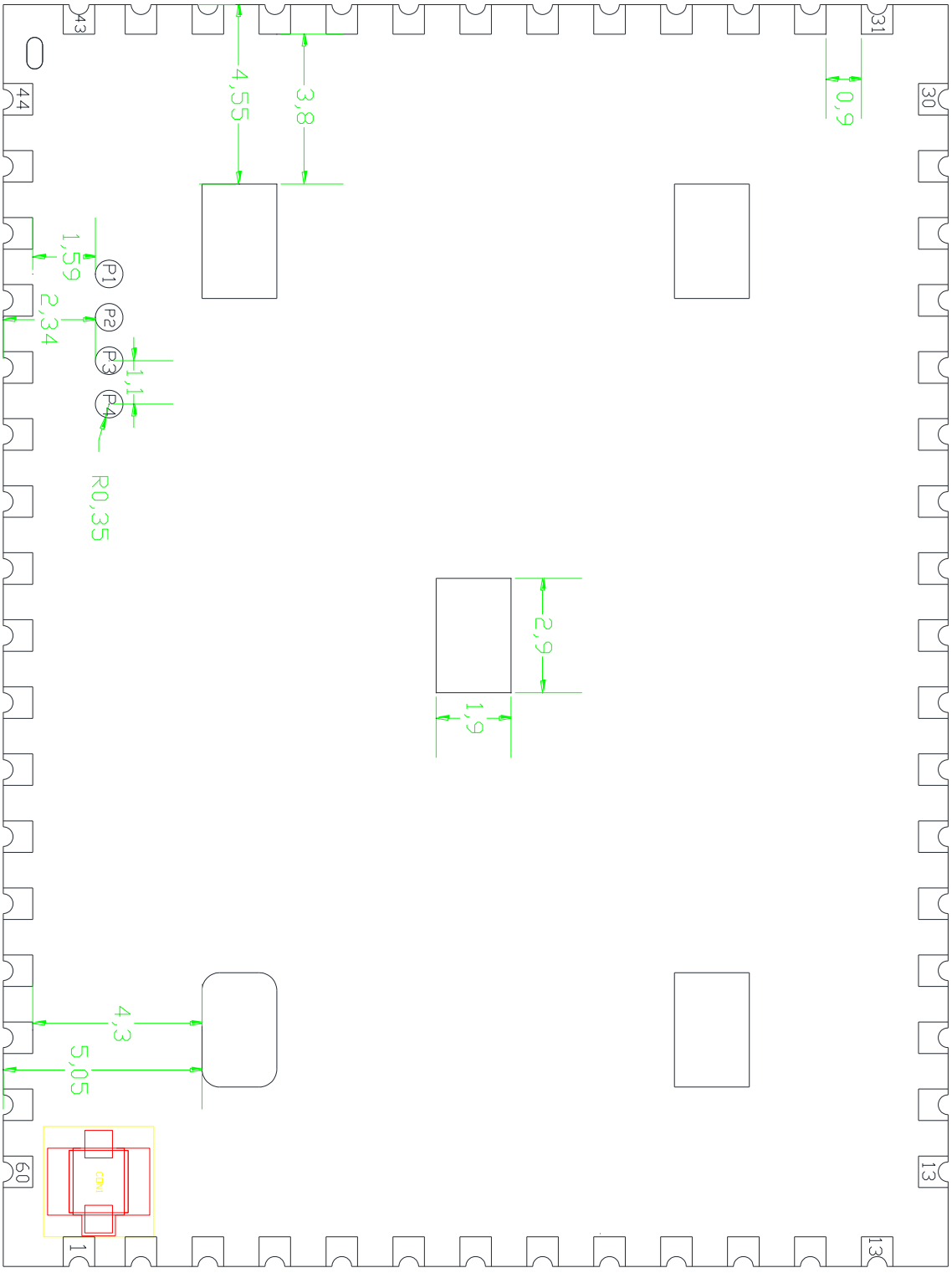
TOP VIEW



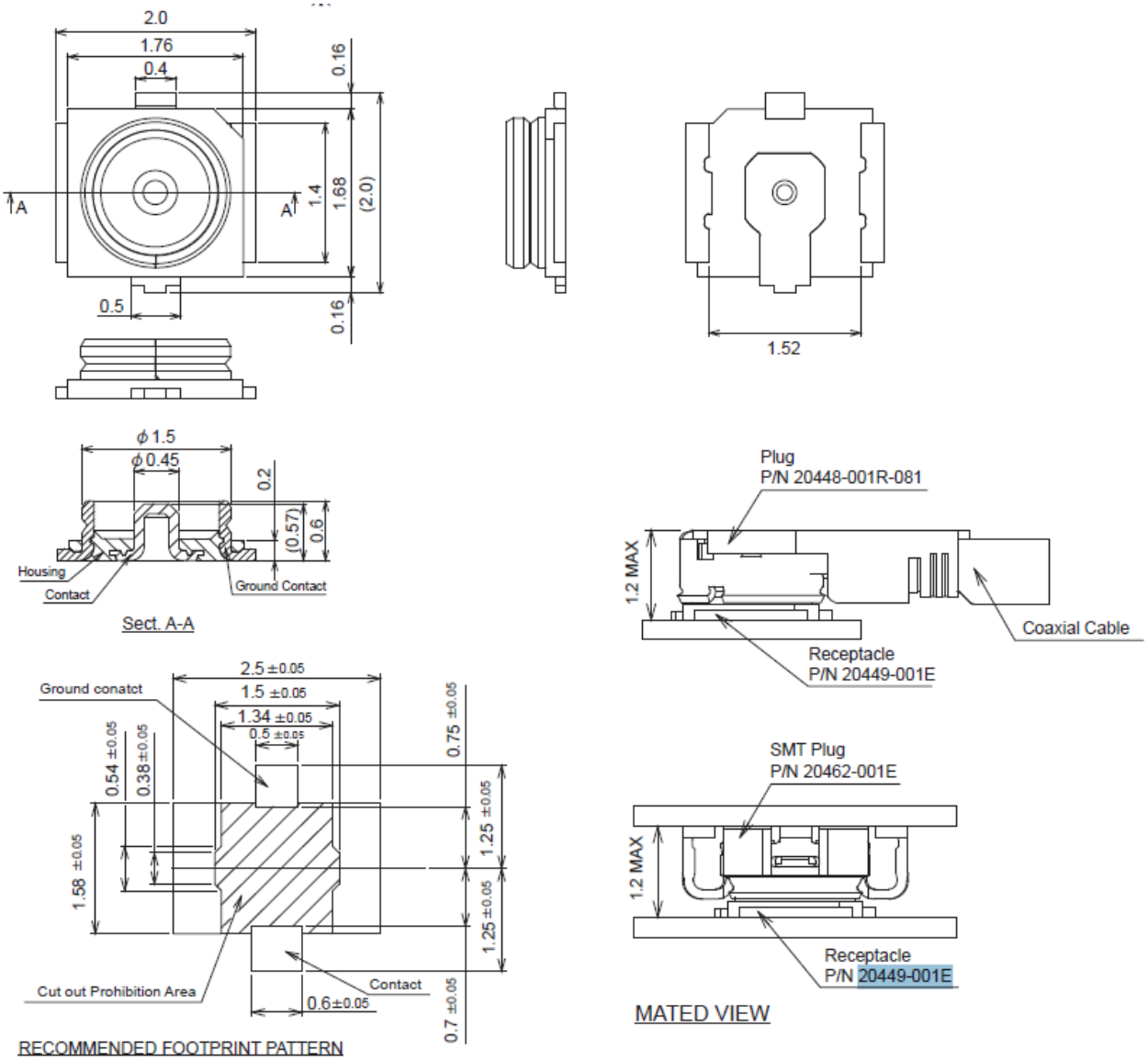
4.3. AI7688H Footprint Dimension

UNIT：:mm

TOPVIEW



4.4. Antenna Connector Dimension



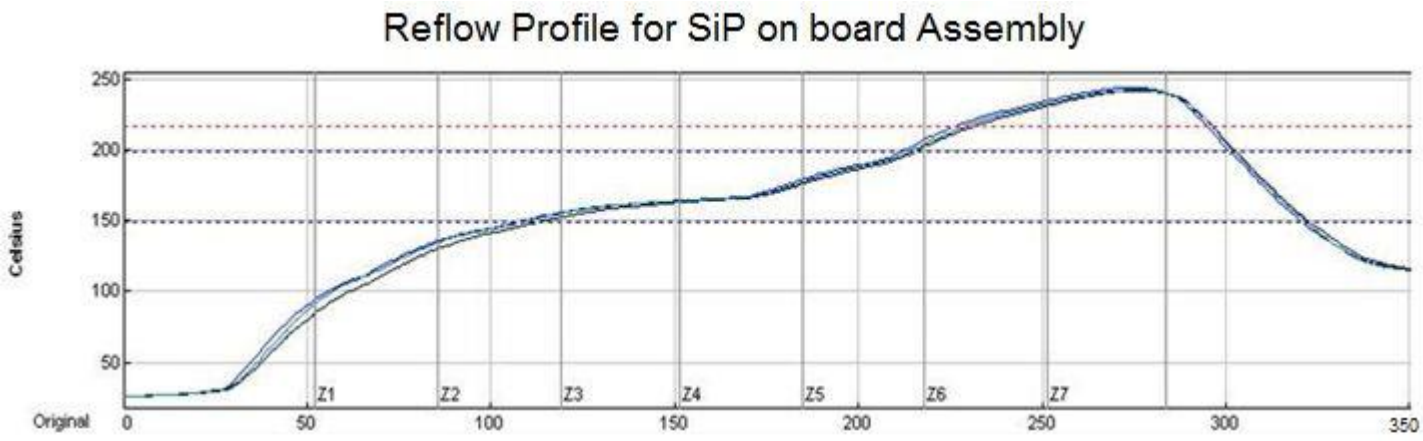
5. Regulator

This SiP module is pre-scaned on module level to comply with following standards:

• FCC IDENTIFIER：2ADWC-AI7688H

•CE Test Report No. ：LD160513C24

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

Figure 1 below details the standard product marking for all AcSiP Corp. products. Cross reference to the applicable line number and table for a full detail of all the variables.

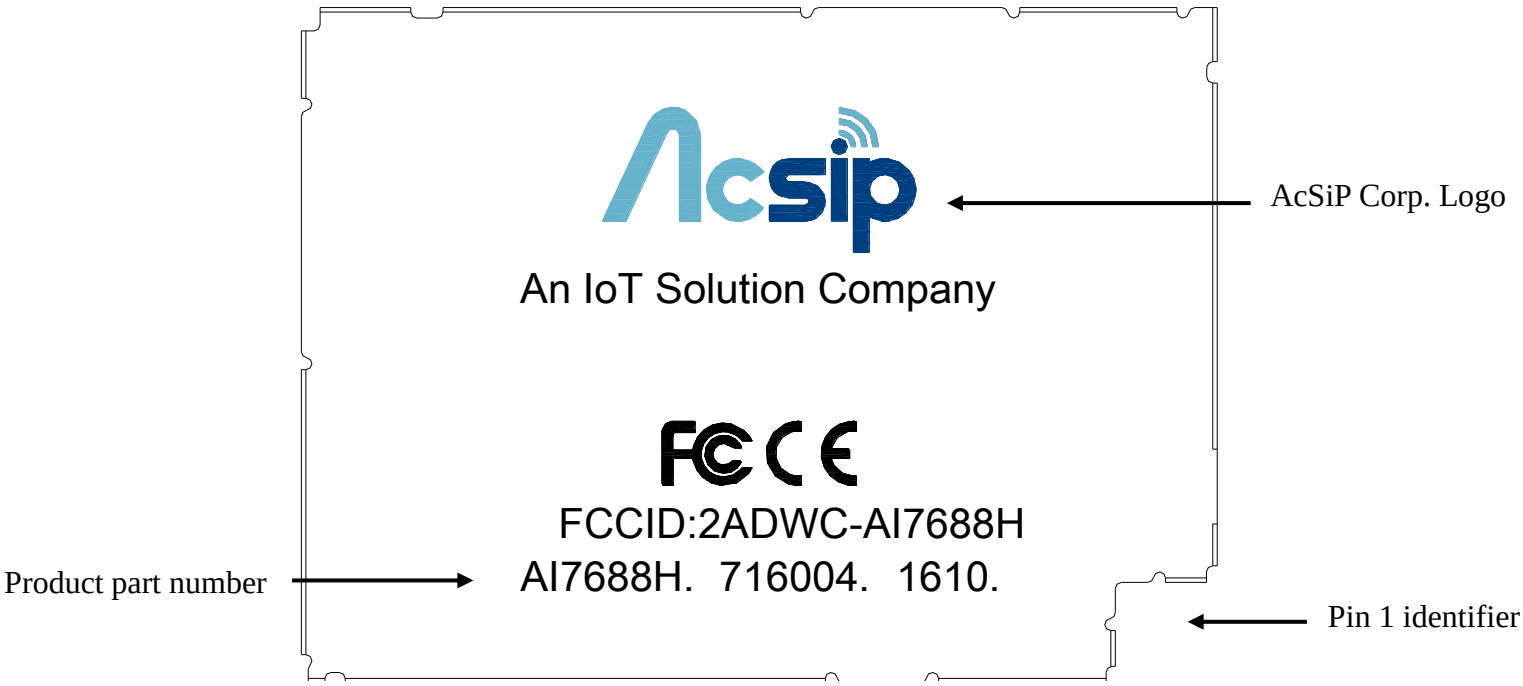
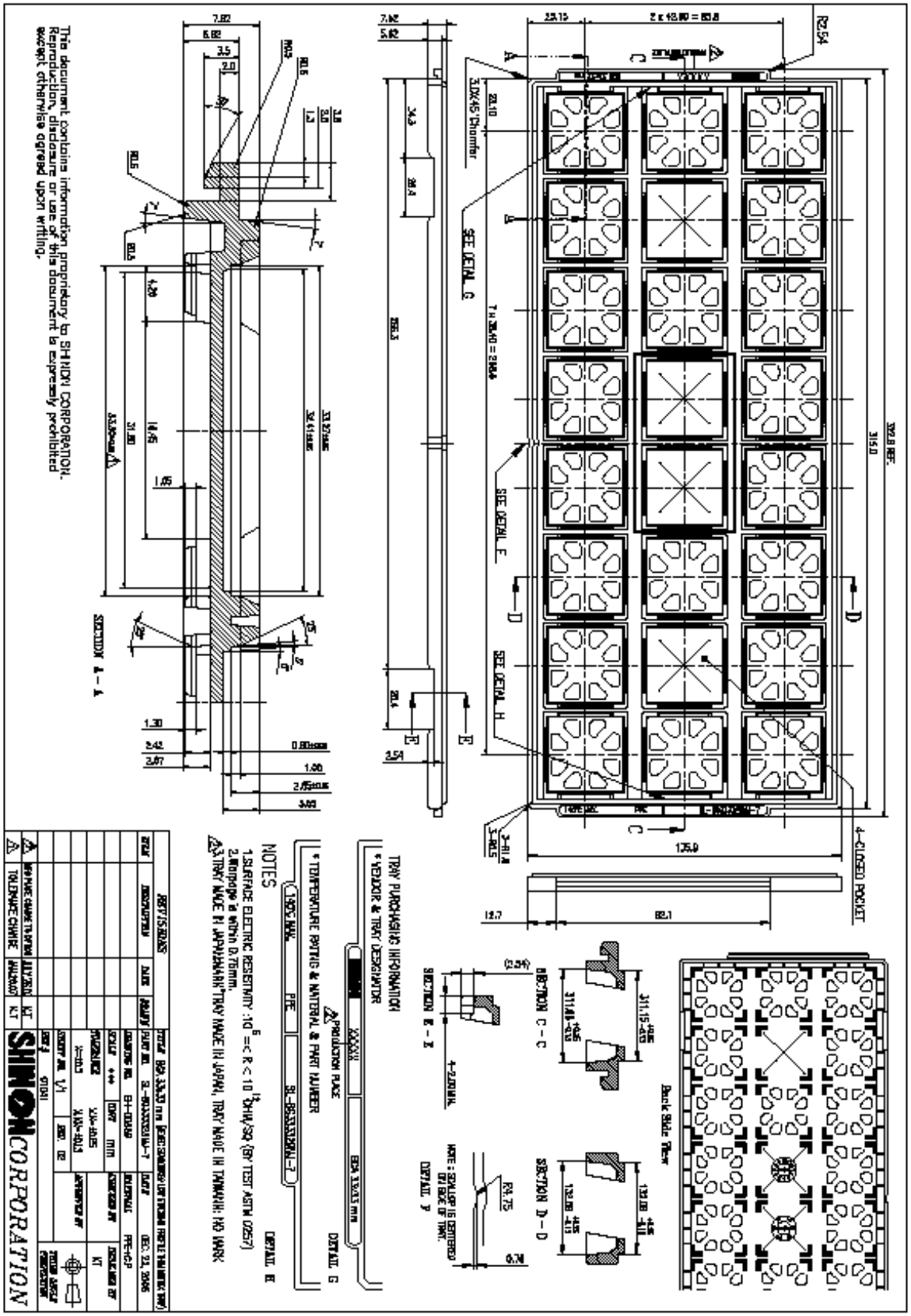
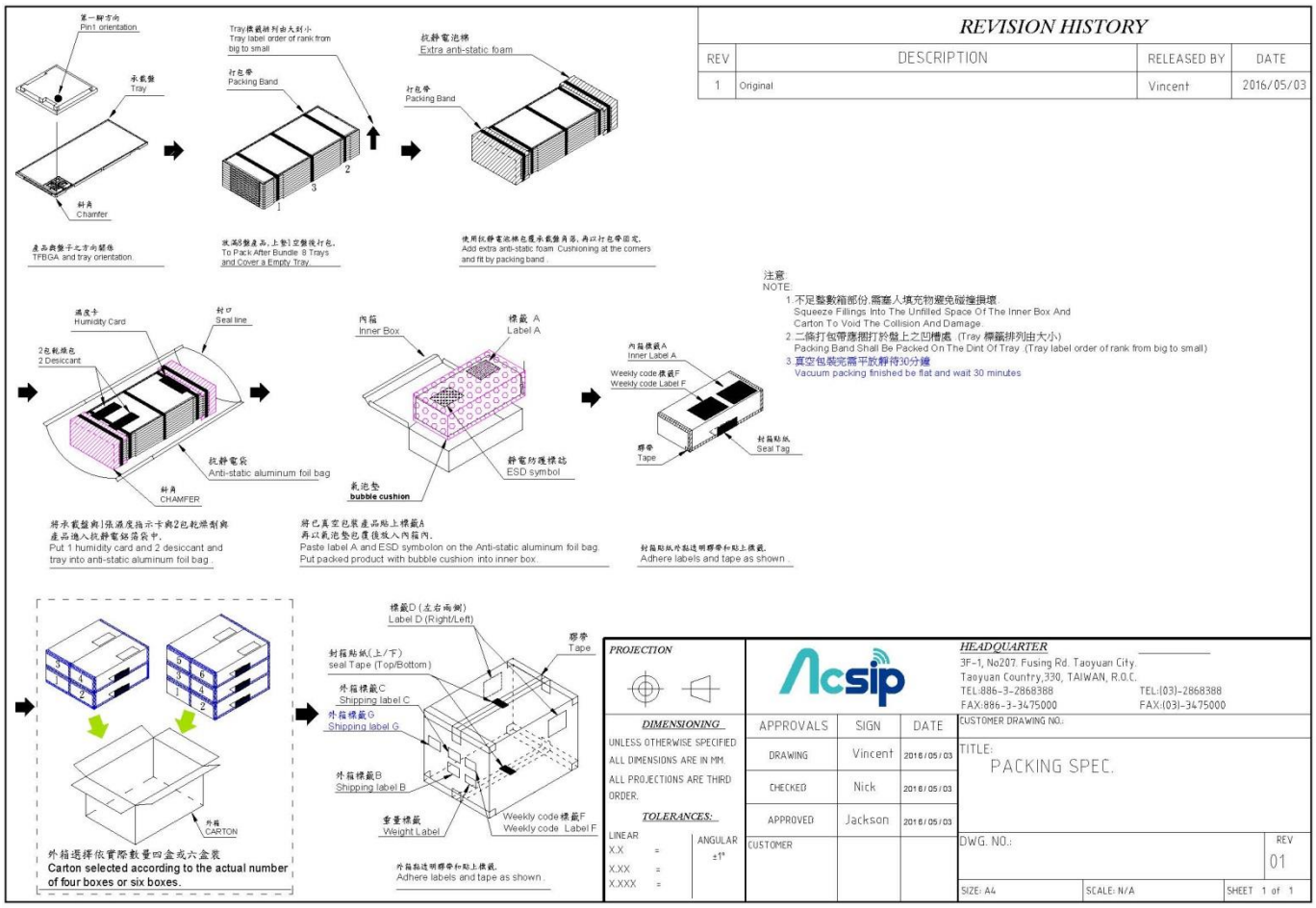


Figure 1 Standard Product Marking Diagram- TOP VIEW

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)