

PRODUCT SPECIFICATION

Product Name	AI7681H MT7681 802.11b/g/n IOT Module
Version	D
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AcSIP Technology Corp.

A wireless communication SiP Solution Provider

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Document History

Date	Revised Contents	Revised By	Version
Dec 9 th , 2014	Initial Version	Kidd	A
Feb 6 th , 2015	Change Document Format & Specification	Kidd	B
Apr 17 th , 2015	Change Mechanical Dimensions & Product Marking	Kidd	C
May 19 th , 2015	Change Product Marking for FCC & CE	Kidd	D

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1. Description

AcSiP Technology Corp. introduces a low-cost and low-power consumption IOT module, AI7681H. The AI7681H integrate Wi-Fi single chip, which supports IEEE 802.11b/g/n stream, providing GPIO for intelligent control, and UART interfaces for device communication.

The AI7681H integrate chip antenna and 8Mbits flash to reduce customer platform size. And also integrate power manage unit for single 3.3V power source for cost effective design.

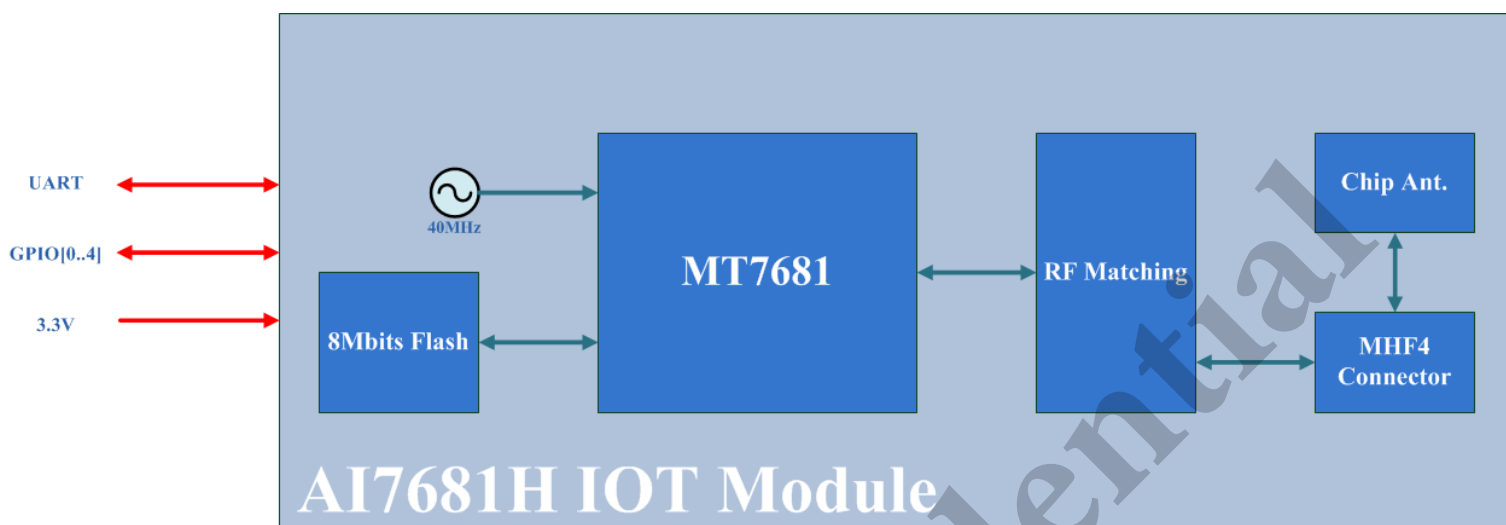
The AI7681H embedded 32-bit RISC MCU for 802.11b/g/n drivers, supplicant, TCP/IP protocol stack, and networking applications, can be operated in station mode and softAP mode. The AI7681H is an ideal solution for embedded device to enable networking service with minimized design effort.

Feature

- Small footprint : 18 mm x 15 mm x 1.7 mm
- Single stream IEEE 802.11 b/g/n
- 32-bit RISC microprocessor as the host MCU
- Embedded IEEE 802.11 b/g/n drivers, supplicant, and TCP/IP stack
- Highly integrated RF PA, LNA, and RF switch
- Integrate chip antenna and 8Mbits flash
- Integrate high efficiency switching regulator for single 3.3V power source
- Security support for WFA WPA/WPA2 personal, WPS2.0, WAPI
- Operation in station mode or softAP mode
- Rich interfaces, UART and GPIOs
- RoHS & Halogen free compliant / Lead free

1-1. Block Diagram

A simplified block diagram of the AI7681H IOT module is depicted in the figure below.



1-2. Specification

Model Name	AI7681H
Product Description	IOT Module
Network Standard	Station mode : IEEE 802.11b/g/n AP mode : IEEE 802.11b/g
Host Interface	UART / GPIO[0..4]
Operation Conditions	
Temperature	<ul style="list-style-type: none"> ■ Storage : -40°C ~ +85°C ■ Operating : -10°C ~ +70°C
Humidity	<ul style="list-style-type: none"> ■ Operating : 10 ~ 95% (Non-Condensing) ■ Storage : 5 ~ 95% (Non-Condensing)
Dimension	18 mm x 15 mm x 1.7 mm
Package	LGA

2. Electrical Characteristics

2-1. Absolute Maximum Ratings

Symbol	Parameter	Min.	Typ.	Max.	Unit
3.3VD	Supply Voltage	-0.3	3.3	3.6	V
3.3VD_RF	Supply Voltage (RF)	-0.3	3.3	3.6	V

2-2. Recommended Operating Range

Symbol	Parameter	Min.	Typ.	Max.	Unit
3.3VD	Supply Voltage	2.97	3.3	3.63	V
3.3VD_RF	Supply Voltage (RF)	2.97	3.3	3.63	V

2-3. DC Characteristics

Symbol	Parameter	Conditions	Min.	Max.	Unit
V _{IL}	Input Low Voltage	LVTTL	-0.28	0.6	V
V _{IH}	Input High Voltage		2.0	3.63	V
V _{OL}	Output Low Voltage	I _{OL} = 1.6~14mA	-0.28	0.4	V
V _{OH}	Output High Voltage	I _{OH} = 1.6~14mA	2.4	VDD+0.33	V
R _{PU}	Input Pull-Up Resistance	PU=High, PD=Low	40	190	KΩ
P _{RD}	Input Pull-Down Resistance	PU=Low, PD=High	40	190	KΩ

2-4. RF Characteristics

2-4-1. RF Characteristics for 802.11b

802.11b Transmit (Conductive)					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency Range		Channel 1		Channel 13	
Tx Power Level	DQPSK	14	16	18	dBm
Frequency Tolerance		-10	0	10	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%		-86		dBm
Max. Input Level	PER<8%			0	dBm

2-4-2. RF Characteristics for 802.11g

802.11g Transmit (Conductive)					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency Range		Channel 1		Channel 13	
Tx Power Level	OFDM	12	14	16	dBm
Frequency Tolerance		-10	0	10	ppm
Modulation Accuracy	All data rate	-28	-30		dB
802.11g Receiver (Conductive)					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency Range		Channel 1		Channel 13	
Min. Input	54Mbps PER<10%		-74		
Max. Input Level	PER<10%			-3.0	dBm

2-4-3. RF Characteristics for 802.11n (2.4GHz)

802.11n_HT20 Transmit (Conductive)					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency range		Channel 1		Channel 13	
Tx Power Level	OFDM	12	14	16	dBm
Frequency Tolerance		-10	0	10	ppm
Modulation Accuracy	All Data Rate	-28	-30		dB
802.11n_HT40 Transmit (Conductive)					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency range		Channel 3		Channel 11	
Tx Power Level	OFDM	12	14	16	dBm
Frequency Tolerance		-10	0	10	ppm
Modulation Accuracy	All Data Rate	-28	-30		dB
802.11n_HT20 Receiver (Conductive)					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency Range		Channel 1		Channel 13	
Min. Input	MCS7 PER<10%		-71		dBm
Max. Input Level	PER<10%			-3.0	dBm
802.11n_HT40 Receiver (Conductive)					
Item	Condition	Min.	Typ.	Max.	Unit
Frequency range		Channel 3		Channel 11	
Min. Input	MCS7 PER<10%		-68		dBm
Max. Input Level	PER<10%			-3.0	dBm

2-5. WLAN Current Consumption

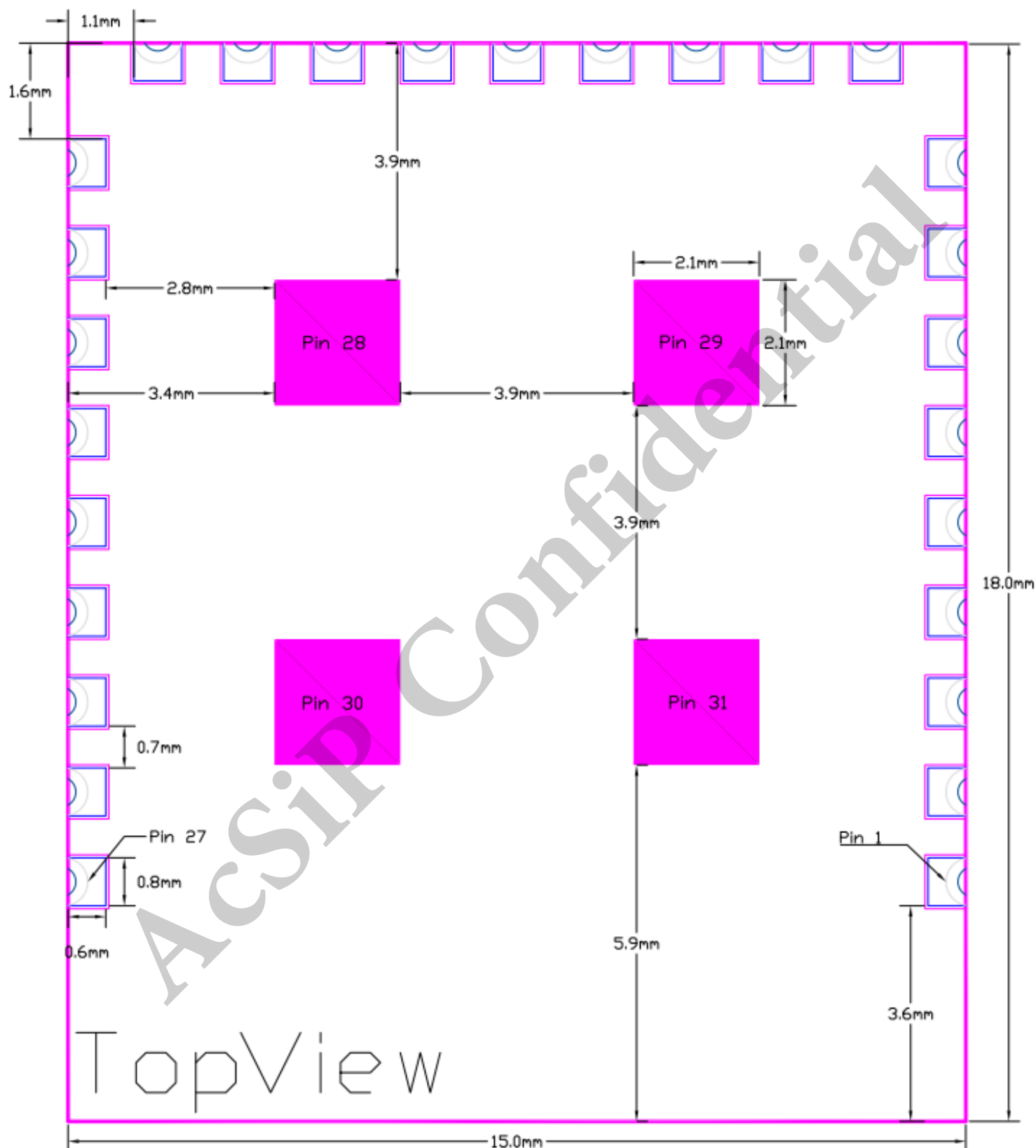
Description	Performance	
	Typ.	Unit
Sleep Mode	1.1	mA
RX Active, HT40, MCS7	151	mA
RX Power Saving, DTIM=1	15	mA
RX Listen	6	mA
TX HT40, MCS7 @ +15dBm	210	mA
TX CCK, 11Mbps @ +19dBm	242	mA

3. Pin Definition

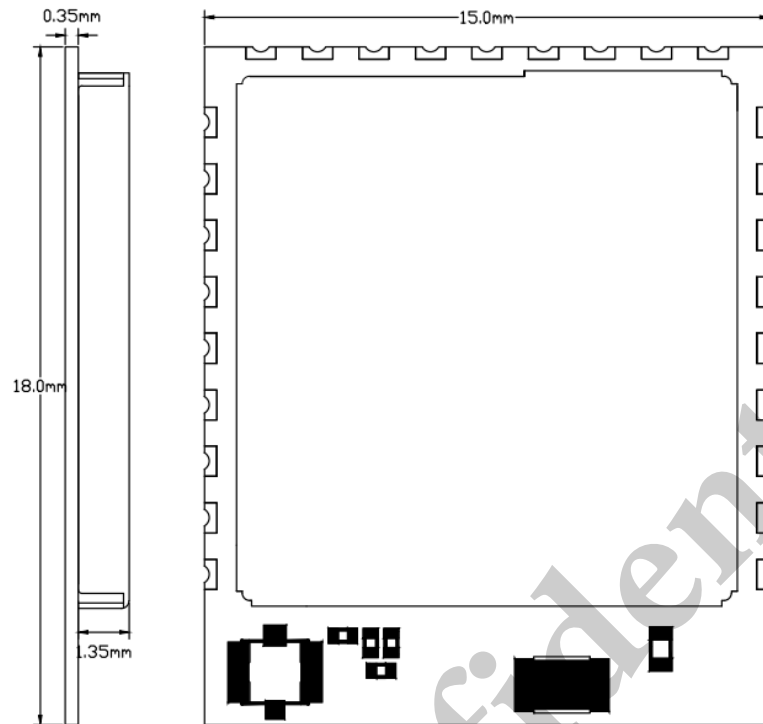
3-1. Pin Description

Pin	Definition	I/O	Description
1	GND	VSS	Ground Pin
2	GND	VSS	Ground Pin
3	GND	VSS	Ground Pin
4	3.3VD	VDD	Power Supply
5	GND	VSS	Ground Pin
6	GND	VSS	Ground Pin
7	GND	VSS	Ground Pin
8	RST_N	I	External System Reset (Low : Active)
9	GND	VSS	Ground Pin
10	UART_RX	I	RX Pin of UART Interface
11	UART_TX	O	TX Pin of UART Interface
12	GND	VSS	Ground Pin
13	GPIO4	I/O	Programmable Input / Output
14	GPIO3	I/O	Programmable Input / Output
15	GPIO2	I/O	Programmable Input / Output
16	GPIO1	I/O	Programmable Input / Output
17	GPIO0	I/O	Programmable Input / Output
18	GND	VSS	Ground Pin
19	NC		
20	NC		
21	NC		
22	NC		
23	GND	VSS	Ground Pin
24	3.3VD_RF	VDD	Power Supply
25	GND	VSS	Ground Pin
26	GND	VSS	Ground Pin
27	GND	VSS	Ground Pin
28~31	ePAD	VSS	Ground Pin

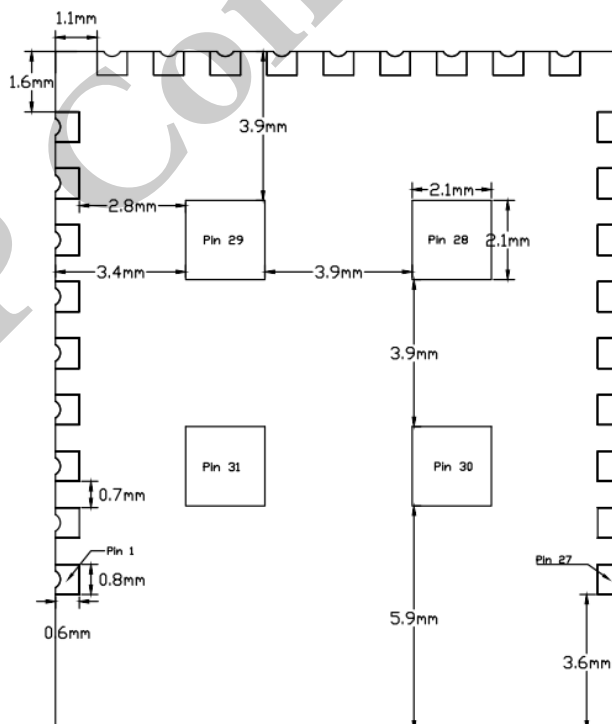
3-2. Pin Assignment and Footprint



3-3. Mechanical Dimensions



TOP VIEW



BOTTOM VIEW

4. Recommended Reflow Profile



~ 150 °C < 2 °C/s	150 ~ 180 °C 55 ~ 65 sec	200°C ~ peak < 1 °C/s	above 220°C 65 ~ 75 sec	Peak Temp. 235~245 °C
1.47	65	0.66	75	241.5

5. Module Preparation

5-1. 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.

Base on reliability test result pass MRT L3 criteria, AI7681H refer to MSL3 criterion.

5-2. SMT Preparation

1. Calculated shelf life in sealed bag: 6 months at <40 degree and <90% relative humidity (RH).
2. Peak package body temperature: 250 degree.
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 degree / 60% RH.
 - B. Stored at $\leq 10\%$ 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 degree.
 - 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 degree.

6. Package Information

6-1 Product Marking



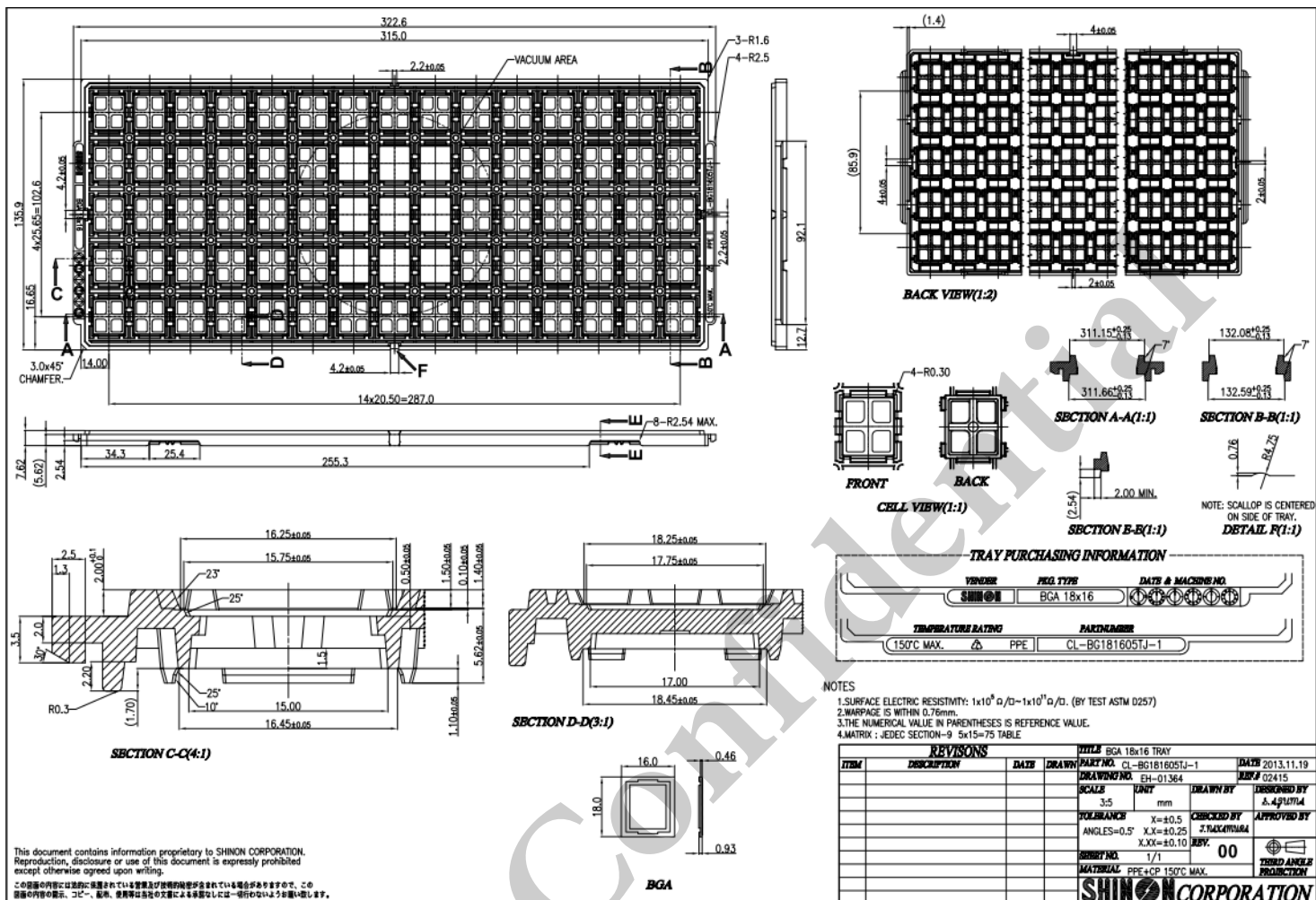
Line 1: AcSiP Logo (Fixed)

Line 2: Product name (Fixed)

Line 3: MediaTek Logo (Fixed)



6-2 Tray Dimension



6-3 Packing Information

第一步方向 Pin1 orientation

承載盤 Tray

斜角 Chamfer

產品與盤子之方向關係 TPBGA and tray orientation.

Tray 標籤排列由大到小 Tray label order of rank from big to small

打包裝 Packing Band

抗靜電泡棉 Extra anti-static foam

打包裝 Packing Band

產品與盤子之方向關係 TPBGA and tray orientation.

完成包裝產品, 上蓋1空盤後打包裝 To Pack After Bundle 8 Trays and Cover a Empty Tray

使用抗靜電泡棉包裹承載盤角處, 再以打包裝固定。 Add extra anti-static foam Cushioning at the corners and fit by packing band.

溫度卡 Humidity Card

2包乾燥包 2 Desiccant

封口 Seal line

抗靜電袋 Anti-static aluminum foil bag

斜角 CHAMFER

將承載盤內1張溫度指示卡與2包乾燥劑與產品進入抗靜電袋袋中。 Put 1 humidity card and 2 desiccant and tray into anti-static aluminum foil bag.

內箱 Inner Box

標籤 A Label A

氣泡墊 bubble cushion

靜電防護標誌 ESD symbol

將已真空包裝產品貼上標籤A 再以氣泡墊包裹後放入內箱內。 Paste label A and ESD symbol on the Anti-static aluminum foil bag. Put packed product with bubble cushion into inner box.

內箱標籤A Inner Label A

Weekly code 標籤F Weekly code Label F

膠帶 Tape

封箱貼紙 Seal Tag

封箱貼紙外箱透明膠帶和貼上標籤。 Adhere labels and tape as shown.

外箱 CARTON

外箱選擇依實際數量四盒或六盒裝 Carton selected according to the actual number of four boxes or six boxes.

外箱標籤C Shipping label C

外箱標籤G Shipping label G

外箱標籤B Shipping label B

重量標籤 Weight Label

Weekly code 標籤F Weekly code Label F

封箱貼紙(上/下) Seal Tape (Top/Bottom)

膠帶 Tape

標籤D (左右兩側) Label D (Right/Left)

外箱貼紙透明膠帶和貼上標籤。 Adhere labels and tape as shown.

REVISION HISTORY			
REV	DESCRIPTION	RELEASED BY	DATE
1	Original	Josh	2014/12/10

注意: NOTE:

- 不足整數箱部份, 需塞入填充物避免碰撞損壞。 Squeeze Fillings Into The Unfilled Space Of The Inner Box And Carton To Void The Collision And Damage.
- 二條打包裝應綁打於盤上之凹槽處。(Tray 標籤排列由大到小) Packing Band Shall Be Packed On The Dint Of Tray. (Tray label order of rank from big to small)
- 真空包裝光需平放靜待30分鐘 Vacuum packing finished be flat and wait 30 minutes

PROJECTION

DIMENSIONING

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MM. ALL PROJECTIONS ARE THIRD ORDER.

TOLERANCES:

LINEAR	±0.1	ANGULAR	±1°
X.X	±0.1		
X.XX	±0.05		
X.XXX	±0.02		

HEADQUARTER			
3F-1, No.207, Fusing Rd. Taoyuan City, Taoyuan Country, 330, TAIWAN, R.O.C.		207 3	
TEL: 886-3-2868388		TEL: (03)-2868388	
FAX: 886-3-3475000		FAX: (03)-3475000	
CUSTOMER DRAWING NO.			
TITLE: PACKING SPEC. PACKING FOR M214			
DWG. NO.: M214 PKG		REV 01	
SIZE: A4		SCALE: N/A	
		SHEET 1 of 1	

6-4 Humidity Indicator Card



Dry (乾燥)

Wet (潮濕)

Indicates 指示點:

5%, 10%, 60% relative humidity

5%, 10%, 60% 相對濕度

Color Change 顏色變化:

Brown (Dry) → Blue (Wet)

棕色 (乾燥) → 藍色 (潮濕)

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

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

Country Code selection feature to be disabled for products marketed to the US/CANADA

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna,
- 3) For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.

As long as 3 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2ADWC-AI7681H".

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.