

# APPROVAL SHEET

Customer : 欣宏電子股份有限公司

Product : SMD8105-A0X

Part NO. : SMD8105-A08-00S

燒錄程式名稱: : FP2100A\_6BBE\_0x735A\_1040817.hex

程式 Checksum : 6BBE

**E-Signal Signature**

**Customer's Signature**

日期:2017.08.02

# BLE Module

## *SMD8105-A08-00S* *Specification*

### Revision History

Rev.	History	Issue Date	Remark
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1.00	Initial issue SMD8105-A08-00S	Jan, 2016	Preliminary

## General Description:

SMD8105-A08-00S is a high performance and low cost 2.4GHz FSK/GFSK system-on-chip (SOC) wireless transceiver.

With on chip fraction-N synthesizer, it can support the application of data rate from 4Kbps to 2Mbps and

frequency hopping system.

This device integrates high speed pipeline 8051 MCU, 32K Bytes In-system programmable flash memory, 2KB SRAM, various powerful functions and excellent performance of a leading 2.4GHz FSK/GFSK RF transceiver.

It can be operated with wide voltage from 2.0V ~ 3.6V.

SMD8105-A08-00S has various operating modes, making it highly suited for systems where ultra-low power consumption is required.

## Features:

- Frequency Range: 2400 ~ 2483.5 MHz ISM (channel spacing is 1MHz).
- Modulate mode: GFSK.
- Bluetooth Qualified Design Listing (QDL)pass.
- Support the application of data rate from 4Kbps to 2Mbps.
- Using AES-128 CCM encryption algorithm.
- All packets are using the 24-bit CRC checksum.
- Automatically adapt to the fast frequency hopping.
- Bluetooth 4.0 Single mode.
- Power supply @2.0V~3.6V
- Very Low Power Operation.
- With Shielding case.
- Outline: 18.3 x 15.9 mm( $\pm 0.2$ mm).

## Applications:

- Lighting control.
- Temperature detection .
- Wearable devices.
- UART interface control.
- SPI interface control.

## Module Electrical Specifications:

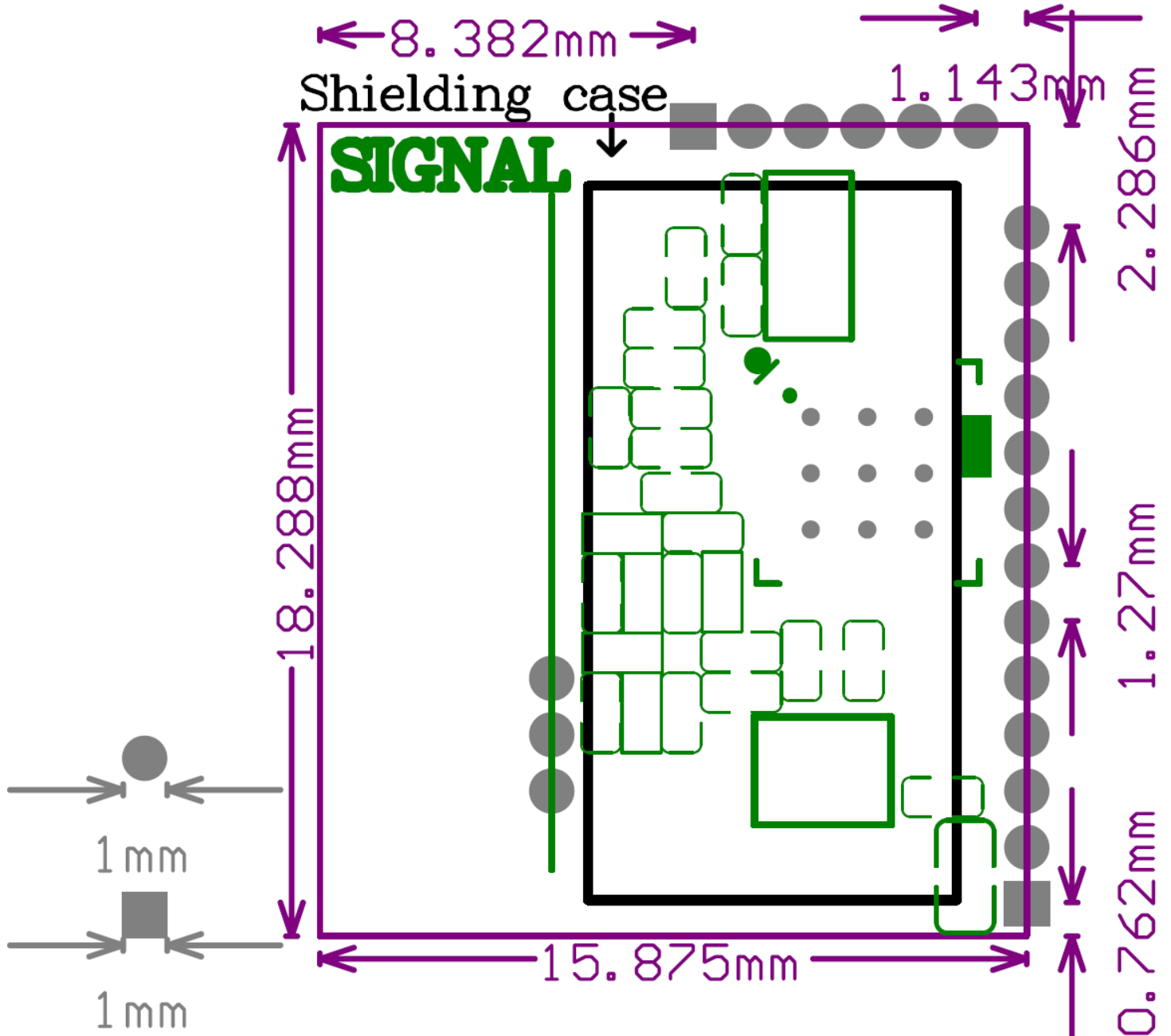
Item	Specification	Remark
Supply voltage	2.0V~3.6V	

Current consumption	0.8uA @Deep Sleep mode 3mA @Stand-by mode 9.5mA @PLL mode 18mA @Rx mode 23.5mA @Tx mode (Pout = 6dBm)	typical
Frequency	2402 – 2480 MHz	ISM band
Transmit output power	6 dBm @ room temperature	Typical <b>Annotation1</b>
Rx sensitivity	-92 dBm (typical) @ 1Mbps mode	BER≤1E-3
Modulation	GFSK	
Interface	19 pin 1.27mm header	
Dimension	18.29mm(L) x 15.88mm(W) ±0.2mm with Antenna (Module thickness Max is 1.8mm)	
Operating temperature	-40 ~ 85 °C	

**Annotation1:**
**1. Tx output power = 6dBm,**
**Register: [082C] Tx test(TBG: 6, PAC: 3, TXCS: Low Current ) value:0X5E.**
**2. TX output power can be set by Register: [082C] Tx test.**

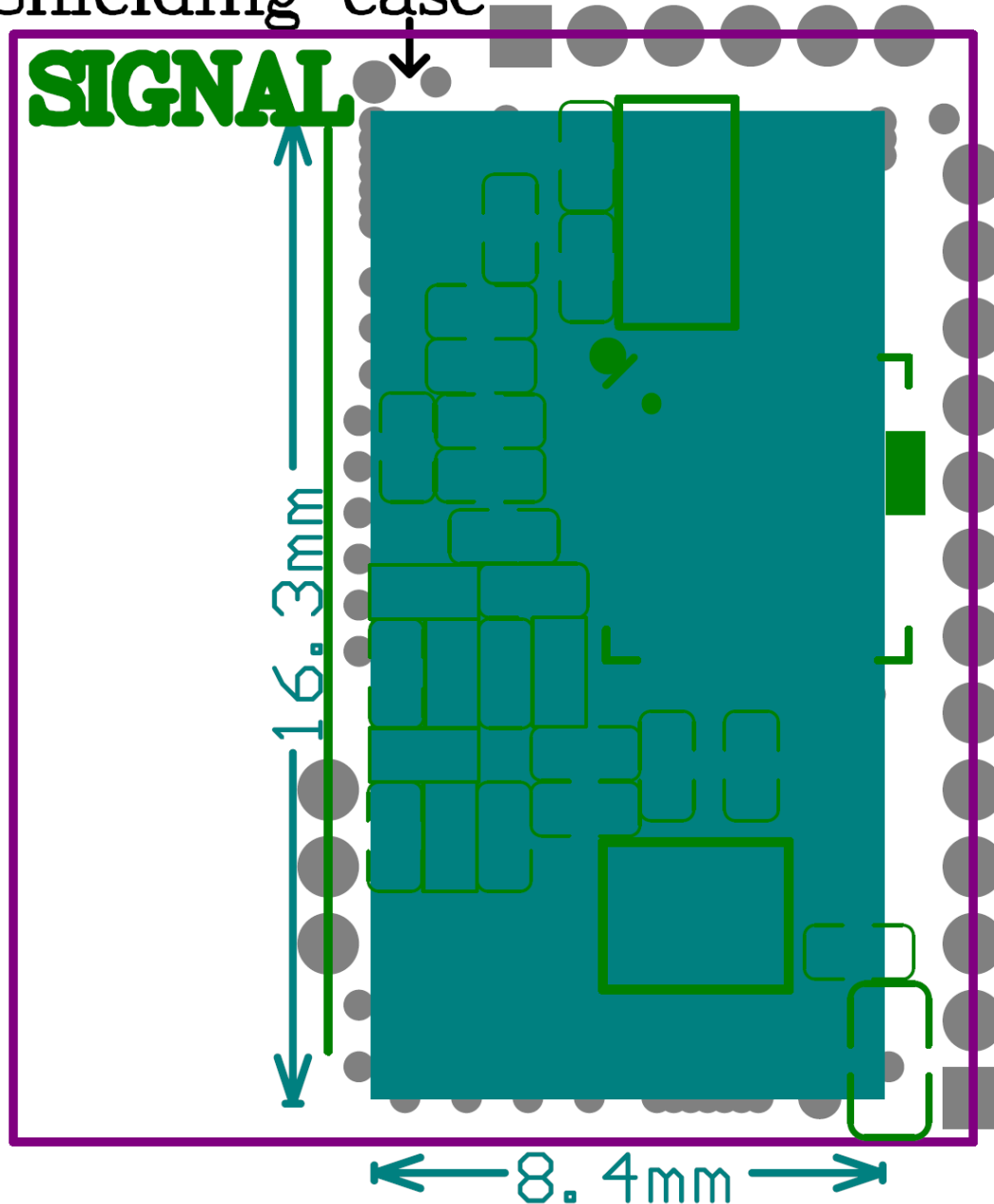
## *Module dimension drawing (Top view)*

**Module PCB size :**



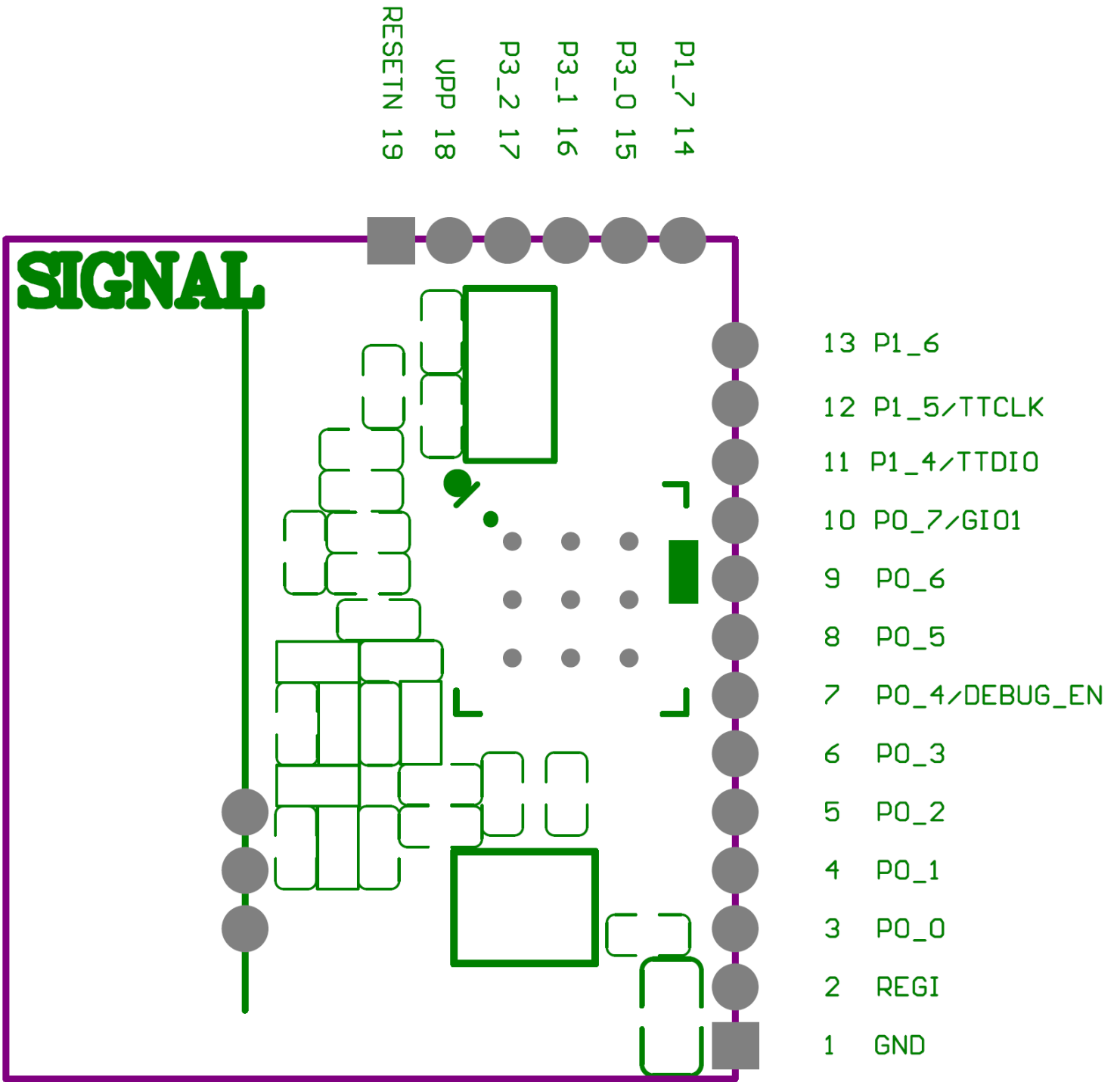
Shielding case shroud module Diagram:

Shielding case



Module PCB\_T=0.8mm  
Shielding case\_T=2.0mm

Module Pin Assignments:

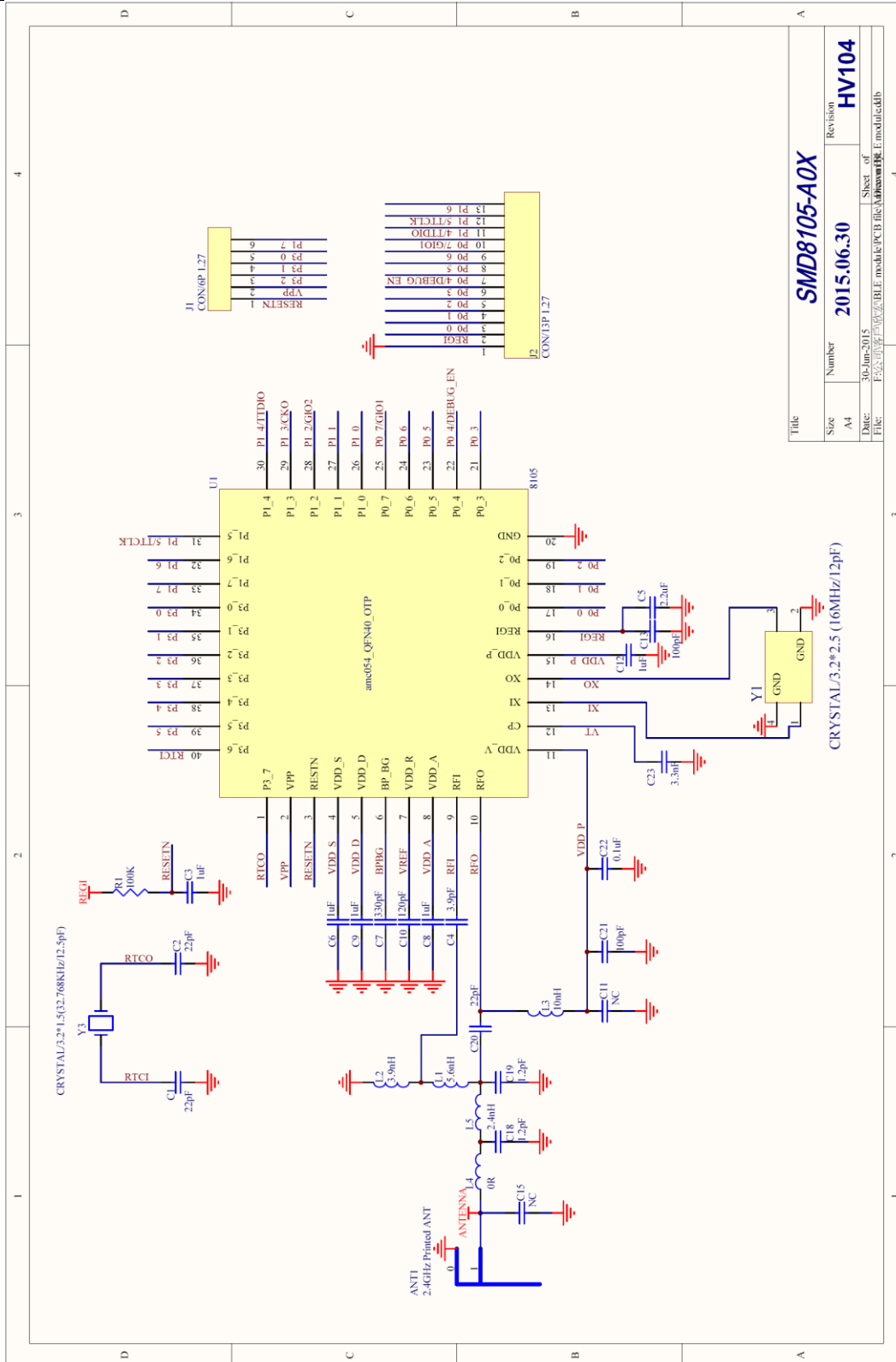


**Module Pin Functions:**



Pin No.	Symbol	Function Description	Remark
1	GND	Ground.	
2	REGI	RF Module supply voltage supply input.	2.0 ~ 3.6V
3	P 0_0	SPI_SCLK/IN0.	
4	P 0_1	SPI_MOSI/CS0.	
5	P 0_2	SPI_MISO/RS0.	
6	P 0_3	SPI_SSEL/RT0.	
7	P 0_4	GPIO/ICE mode.	
8	P 0_5	I2C_SCL.	
9	P 0_6	I2C_SDA.	
10	P 0_7	INT2/GIO1.	
11	P 1_4	TTAG_TTDIO AMICCOM CONFIDENTIAL.	
12	P 1_5	TTAG_TTCLK.	
13	P 1_6	PWM0/ADC4	
14	P 1_7	PWM1/ADC5.	
15	P 3_0	UART0_RX/ADC6.	Corresponds to MCU_TX
16	P 3_1	UART0_TX/ADC7.	Corresponds to MCU_RX
17	P 3_2	INT0/ADC0.	
18	VPP	High voltage pin used for OTP ROM program.	
19	RESETN	RESETN.	

## Module Application Circuit:



Title		<b>SMD8105-A0X</b>	
Size	Number	Revision	
A4	<b>2015.06.30</b>	<b>HV104</b>	
Date:	30-Jun-2015	Sheet	of
File:	E:\公司项目\蓝牙\BLE module\PCB file\Subversion\fig_E module.dfb		

### Module Bill of Material:

欣宏電子 BOM List

欣宏電子 BOM List										
產品型號		SMD8105-A08-00S								
文件版本		HV-100	建立時間		2015/4/15	RD:		廖志強		
Item	數量	Component	Description	Tolerance	規格 (紅字部分不得用替代用料) (藍字部分則可使用替代用料)	尺寸/型式	Tolerance	Manufacturer P/N.	Manufacturer(廠牌)	備註
	用量									
1	2	C18,C19	C0G ceramic capacitor	±0.25 pF	1.2pF	0402	50V	GRM1555C1H1R2CA01D	Murata Electronics	
2	1	C4	C0G ceramic capacitor	±0.25 pF	3.9pF	0402	50V	GRM1555C1H3R9CA01D	Murata Electronics	
3	3	C1, C2, C20	C0G ceramic capacitor	±5 %	22pF	0402	50V	GRM1555C1H220JA01D	Murata Electronics	
4	2	C13, C21	C0G ceramic capacitor	±5 %	100pF	0402	50V	GRM1555C1H101JA01D	Murata Electronics	
5	1	C10	C0G ceramic capacitor	±5 %	120pF	0402	50V	GRM1555C1H121JA01D	Murata Electronics	
6	1	C7	C0G ceramic capacitor	±5 %	330pF	0402	50V	GRM1555C1H331JA01D	Murata Electronics	
7	1	C23	X7R ceramic capacitor	±10 %	3.3nF	0402	50V	GRM155R71H332KA01D	Murata Electronics	
8	1	C22	X7R ceramic capacitor	±10 %	0.1uF	0402	16V	GRM155R71C104KA88D	Murata Electronics	
9	5	C3, C6, C8, C9, C12	X5R ceramic capacitor	±10 %	1uF	0402	10V	GRM155R61A105KE15D	Murata Electronics	
10	1	C5	X5R ceramic capacitor	±10 %	2.2uF	0603	6.3V	GRM188R60J225KE19D	Murata Electronics	
11	1	L4	chip resistors	±5 %	0 ohm	0402	50V		YAGEO	RC0402 1/16 W
12	1	R1	chip resistors	±5 %	100K ohm	0402	50V		YAGEO	RC0402 1/16 W
13	1	L5	Chip inductor	±0.3nH	2.4nH	0402	300mA	LQG15HS2N4S02D	Murata Electronics	
14	1	L2	Chip inductor	±0.3nH	3.9nH	0402	300mA	LQG15HS3N9S02D	Murata Electronics	
15	1	L1	Chip inductor	±0.3nH	5.6nH	0402	300mA	LQG15HS5N6S02D	Murata Electronics	
16	1	L3	Chip inductor	±5%	10nH	0402	300mA	LQG15HS10NJ02D	Murata Electronics	
17	1	Y3	Crystal	± 20 PPM	32.768KHz, CL = 12.5pF	3.2 x 1.5mm			YOKE	
18	1	Y1	Crystal	± 20 PPM	16MHz, CL = 12pF	3.2 x 2.5mm			YOKE	Y1C (spare)
19	1	U1	2.4GHz FSK/GFSK SoC		A8105	QFN 40pin(5x5)		A81X05F5001AQ5A	Amicom	Flash memory_32K
20	1		PCB	± 0.1mm	FR4,ENIG,2 Layer	18.3mm(L) x 15.9mm(W) <sup>2</sup> ,T=0.8mm				
21	1		Shielding case	± 0.08mm		T=0.2mm/16.3mm(L) x 8.4mm(W) <sup>2</sup>				

核准:

審查:

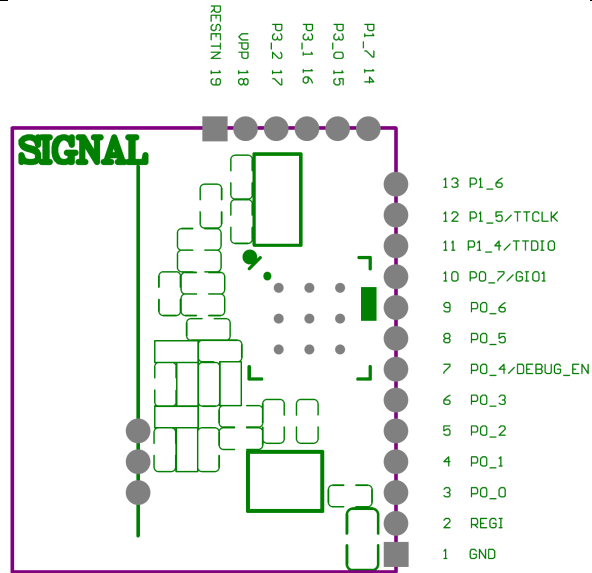
**Annotation1:**

1. A8105 has built-in crystal loading. User can set VCOSC[5:0] to meet crystal loading Requirement.
2. Recommend VCOSC = 20, if crystal load = 12pF.

**Annotation2:**

1. A81X05F5001AQ5A 32K.

## Module Application:



Pin	Symbol	燒錄PIN	BLE to Uart	BLE to Temp.	BLE to LED 1	BLE to LED 2
1	GND	GND	GND	GND	GND	GND
2	REGI	VCC 3V	VCC 3V	VCC 3V	VCC 3V	VCC 3V
3	P0_0		Busy(P0_0)			SPI_SCLK(P0_0)
4	P0_1		Enable(P0_1)==> 1. NC/Pull Hi_ Sleep 2. GND/Pull Low_ Working			SPI_MOSI(P0_1)
5	P0_2					SPI_MISO(P0_2)
6	P0_3					SPI_SSEL(P0_3)
7	P0_4	P0_4/DEBUG_EN				
8	P0_5					
9	P0_6					
10	P0_7					
11	P1_4	P1_4/TTDIO				
12	P1_5	P1_5/TTCLK				
13	P1_6				PWM(P1_6)	
14	P1_7			ADC_1(P1_7)		
15	P3_0		Rx(P3_0)→ MCU_TX			
16	P3_1		Tx(P3_1)→ MCU_RX			
17	P3_2			ADC_2(P3_2)	ADC(P3_2)	ADC(P3_2)
18	VPP					
19	RESETN	RESETN				

UART Mode 9600, 8, N, 1

Module_Tx	UART Tx, No Protocol
Module_Rx	<p>One time max byte is 100 byte including 0x0D, 0x0A.</p> <p>Module_Busy pin will changes from L to H, if UART Rx recievers 0x0D, 0x0A.</p>

Module_EN	Module_Busy	Description
L	L	Module Ready
L	H	Module Busy
H	X	Module Sleep

## Module擺放位置及其周邊零件放置原則和走線原則

1. Module擺放位置盡量越靠近主板的板邊越佳。
2. 針對Module的天線端\_盡量避免擺放其他零件並保持3cm以上,使其達到淨空以避免影響RF特性和天線輻射場形。
3. 所有金屬類之物品\_包括Layout的導線和螺絲以及喇叭(speaker),麥克風(MIC),變壓器(transformer),轉接器(adapter),導線(cable)等等,都要盡量遠離Module的天線端,因為它們會導致天線的阻抗和輻射場形改變。
4. 零件擺設時優先考慮重要訊號線,其零件之相關位置擺設方式,盡可能使其拉線距離愈短愈好。
5. 零件擺設時須預留VCC、GND之跑線寬度。
6. 由於走線呈直角型態時會易積電,放電亦大,容易影響PCB之穩定度,因此盡量以45度之斜角或弧角之方式進行繞線。
7. 線與線之距離不得少於6mils。
8. 線與貫穿孔之距離不得少於6mils。
9. 相鄰兩貫穿孔之距離不得少於6mils。
10. 每條VCC及GND之主幹線線寬不得小於15mils。
11. 各種電源訊號線要進入IC時,必須先經過Bypass電容器後才進入IC腳Pin。
12. 針對Module及MCU之供給的DC電源儘量獨立分開,以避免相互干擾。
13. 針對Module及MCU底下儘量能鋪整片的GND以增其穩定度及EMI的改善。

# QDL Bluetooth® Qualified Design Listing

## The Bluetooth SIG Hereby Recognizes

### SIGNAL ELECTRONIC CO., LTD.

Member Company

Signal A8105 BLE module

Qualified Design Name

Declaration ID: D024558

Qualified Design ID: 62747

Specification Name: 4.0

Product Type: End Product

Model Number: SMD8105-A0X

Listing Date: 05 November 2014

Hardware Version Number: V1.0

Assessment Date: 04 November 2014

Software Version Number: V1.0

This certificate acknowledges the *Bluetooth*® Specifications declared by the member were achieved in accordance with the *Bluetooth* Qualification Process as specified within the *Bluetooth* Specifications and as required within the current PRD



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## Antenna Report

SIGNAL ELECTRONICS CO., LTD.

BLE Module

Model: SMD8105-A0X


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*Page 2 of 3*  
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REPORT NO.: EM-OA140007 (C1M1412156)

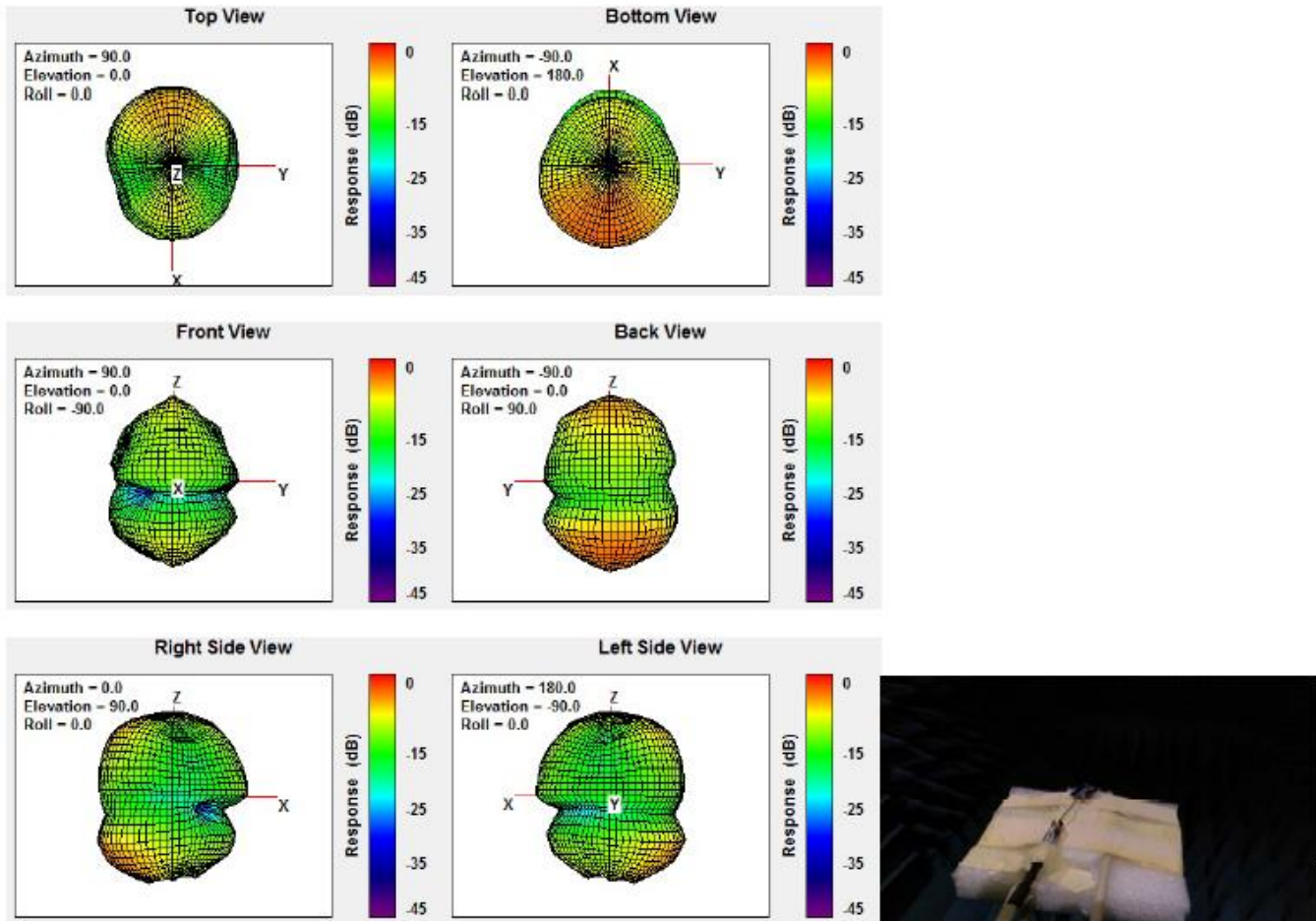
DATE: 2014. 12. 30

Antenna Specification		Antenna View
Antenna Type	PCB Antenna	
Peak Gain	-2.39556dBi	
Average Gain	-6.14593dBi	
Frequency	2400 ~ 2500MHz	

**Antenna Directivity Diagram:**

Frequency (MHz)	2400	2405	2410	2415	2420	2425	2430	2435	2440	2445	2450
Peak Gain (dBi)	-2.89650	-2.74376	-2.62105	-2.53600	-2.47097	-2.48006	-2.57712	-2.55559	-2.60922	-2.72080	-2.65318
Average Gain (dBi)	-6.63781	-6.45508	-6.34285	-6.26217	-6.25742	-6.26652	-6.36447	-6.44376	-6.51002	-6.56296	-6.56093

Frequency (MHz)	2455	2460	2465	2470	2475	2480	2485	2490	2495	2500
Peak Gain (dBi)	-2.82372	-2.64842	-2.71303	-2.63042	-2.55403	-2.44177	-2.39556	-2.49567	-2.44828	-2.55891
Average Gain (dBi)	-6.50647	-6.42142	-6.35117	-6.26349	-6.19752	-6.15090	-6.14593	-6.18826	-6.33908	-6.56930



AUDIX Technology Corporation Report No.: EM-OA140007

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