

# Data Sheet

Ú!;[ å~ &cname : RF 5G Wireless Module

Model Ð[ È: ØEJÛÍ ÀÌ HÖË

Project Code : SMMDIM9QC58RH4

Version 0.2

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## 1. Features

- 5.2GHz/5.8GHz ISM Band
- GFSK modulation
- Low BOM cost
- Long distance > 30m (Line of sight)
- Support 1-1 duplex mode or 1-N broadcasting mode
- RF frequency hopping in 58 channels
- Digital I2S audio interface
- Support no audio detection function
- Audio format 24bit , 32/44.1/48KHz sampling rate
- Robust Packet error correction
- Low power consumption
- No RF induced audio noise
- Compatible with FCC/ CE regulations

## 2. Application

- Wireless HTiB Rear Speaker
- Wireless Outdoor Speaker
- Wireless TV theater
- Wireless Audio Sender
- Wireless Headphone
- Wireless Stereo Ear Microphone

### 3. RF Specification

Item	Min	Typ	Max	Unit	Note
Channel Range	5165	—	5200	MHz	
-20dB bandwidth	—	2.5	—	MHz	
RF Output Power		12		dBm	Peak power at Antenna port
Sensitivity	—	-90	-86	dBm	The smaller, the better

Table 1 5.2GHz RF Specification

Item	Min	Typ	Max	Unit	Note
Channel Range	5740	—	5840	MHz	
-20dB bandwidth	—	2.5	—	MHz	
RF Output Power		11		dBm	Peak power at Antenna port
Sensitivity	—	-89	-86	dBm	The smaller, the better

Table 2 5.8GHz RF Specification

## 4. Audio Specification

2.1 CH						
	Item	Min	Typ	Max	Unit	Note
2.0 CH	SNR	90	94	—	dBr	@1kHz
	THD + N	—	-80	-75	dB	@1kHz, the smaller, the better
	Frequency Response	20	—	20k	Hz	@±1dBm
	Dynamic range	90	94		dB	@1kHz
0.1 CH	SNR	90	94		dBr	@1kHz
	THD + N		-84	-80	dB	@1kHz, the smaller, the better
	Frequency Response	20		5k	Hz	@±3dBm
	Dynamic range	90	94		dB	@1kHz

Note: Test condition is that using Card type EVB board with ADC: AK5357 at master mode and DAC: AK4386 at master mode.

Table 3 ADC to DAC

2.1 CH						
	Item	Min	Typ	Max	Unit	Note
2.0 CH	SNR	135	140		dBr	@1kHz
	THD + N		-100	-95	dB	@1kHz, the smaller, the better
	Frequency response	20		20k	Hz	@±1dBm
	Dynamic range	95	100		dB	@1kHz
0.1 CH	SNR	130	135		dBr	@1kHz
	THD + N		-100	-95	dB	@1kHz, the smaller, the better
	Frequency response	20		5k	Hz	@±3dBm
	Dynamic range	95	100		dB	@1kHz

Note: Test condition is that using sample rate 48 kHz, NFsCLK factor 512 and resolution 24.

Table 4 I2S to I2S

## 5. Electrical Specification

Item	Min	Typ	Max	Unit	Note
Power Supply Voltage	3.0	3.3	3.6	V	
Consumption Current (TX_MODE)	85	100	115	mA	12dBm, continue mode, no GPIO driving
Consumption Current (RX_MODE)	60	65	75	mA	Receiving only, no GPIO driving
Operating Temperature	0	25	55	°C	

Table 5

Item						
Symbol	Parameter	Min	Typ	Max	Unit	Conditions
V <sub>IH</sub>	Input High Threshold	2.0	—	3.33	V	LDO_OUT=3V
V <sub>IL</sub>	Input Low Threshold	-0.3	—	0.8	V	LDO_OUT=3V
V <sub>OH</sub>	Output High Threshold	2.4	—	—	V	LDO_OUT=3V
V <sub>OL</sub>	Output Low Threshold	—	—	0.4	V	LDO_OUT=3V

Table 6

### ◆ Power On Reset Characteristics

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
VDD_CORE	1.8V POR input	1.62	1.8	1.98	V	
PORN	1.8V POR output					
VR18	Rising Detection Level		1.5		V	
VF18	Falling Detection Level	1.33	1.4	1.47	V	
TLH18	Rising Delay	2			μS	VDD_CORE slew rate = 1V/μS
THL18	Falling Delay	2			μS	VDD_CORE slew rate = 1V/μS

Table 7

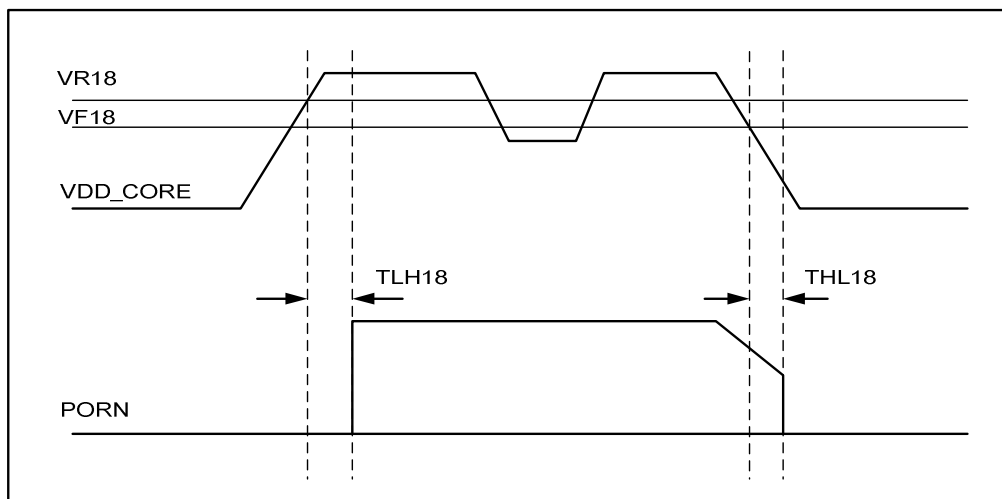


Fig 5.1 Power On Reset Timing Chart

## 6. Mechanical Specification

### 6.1 Without Shielding Case

- Dimension : 20 \* 40 \* 6.7 mm
  - PCB 4 Layers
- Mechanical Drawing :

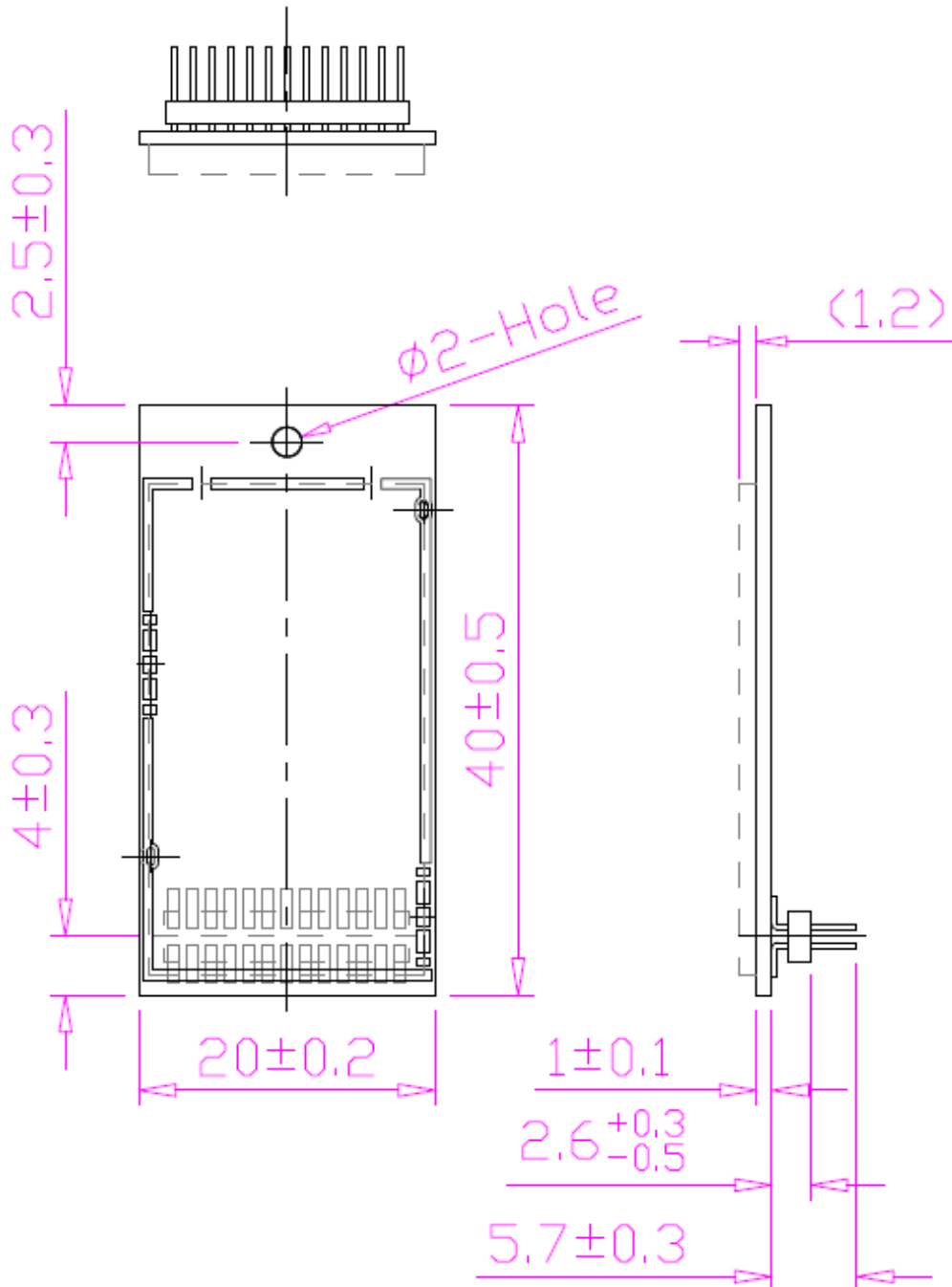
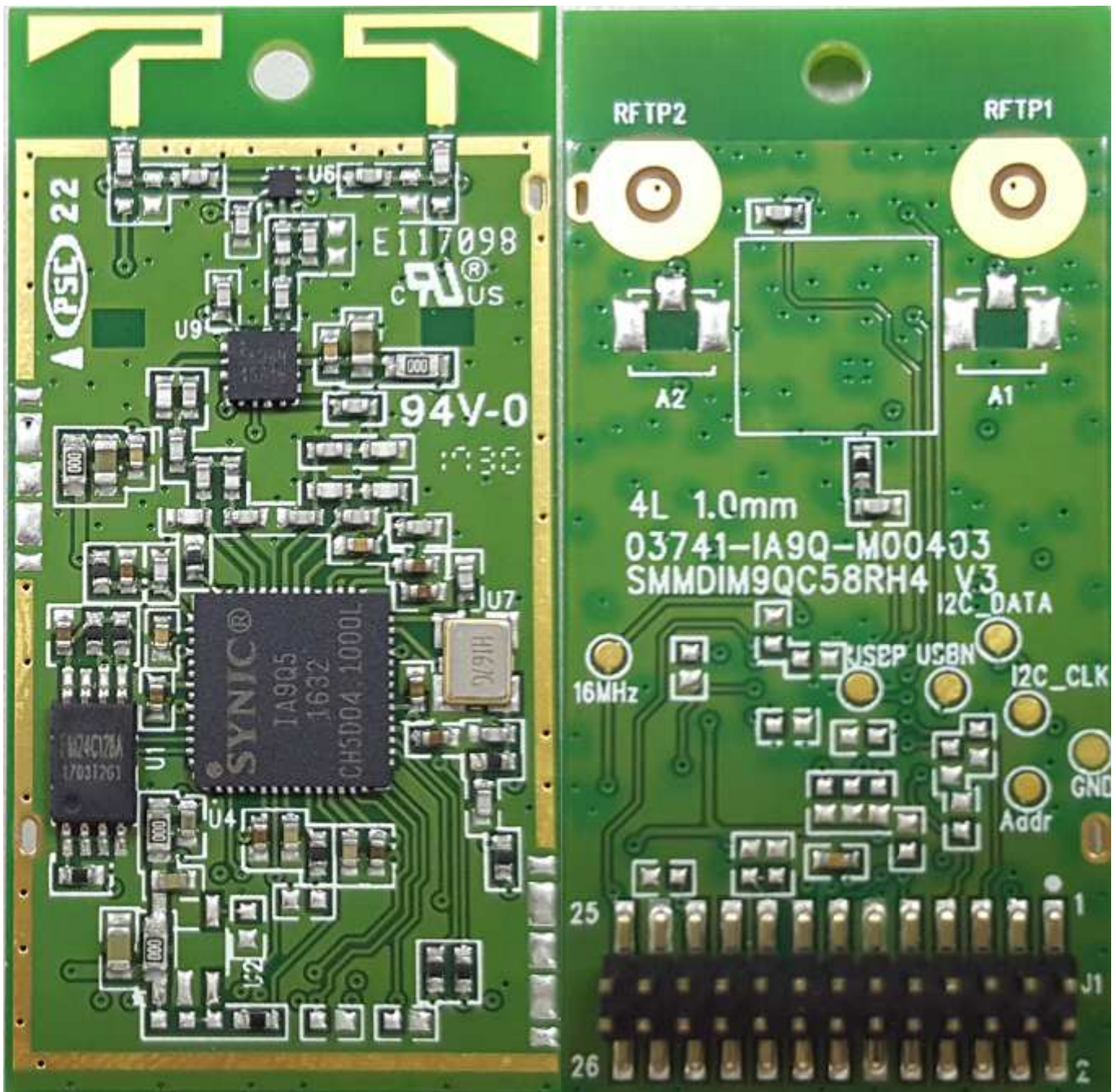


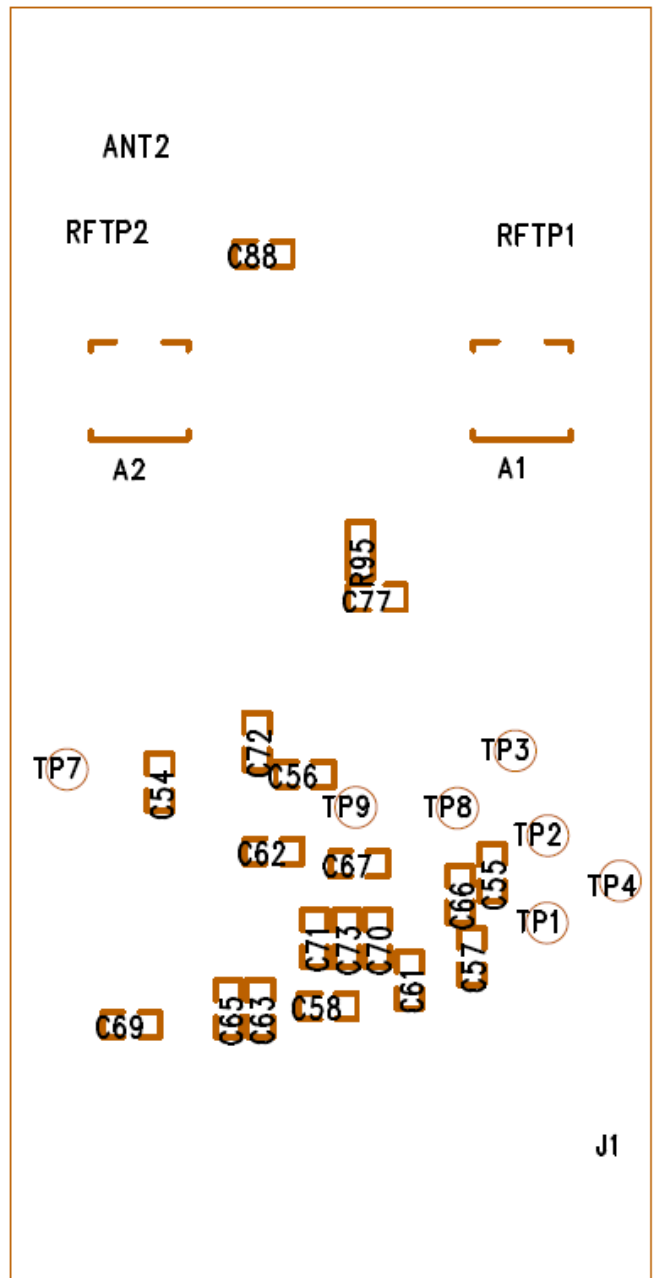
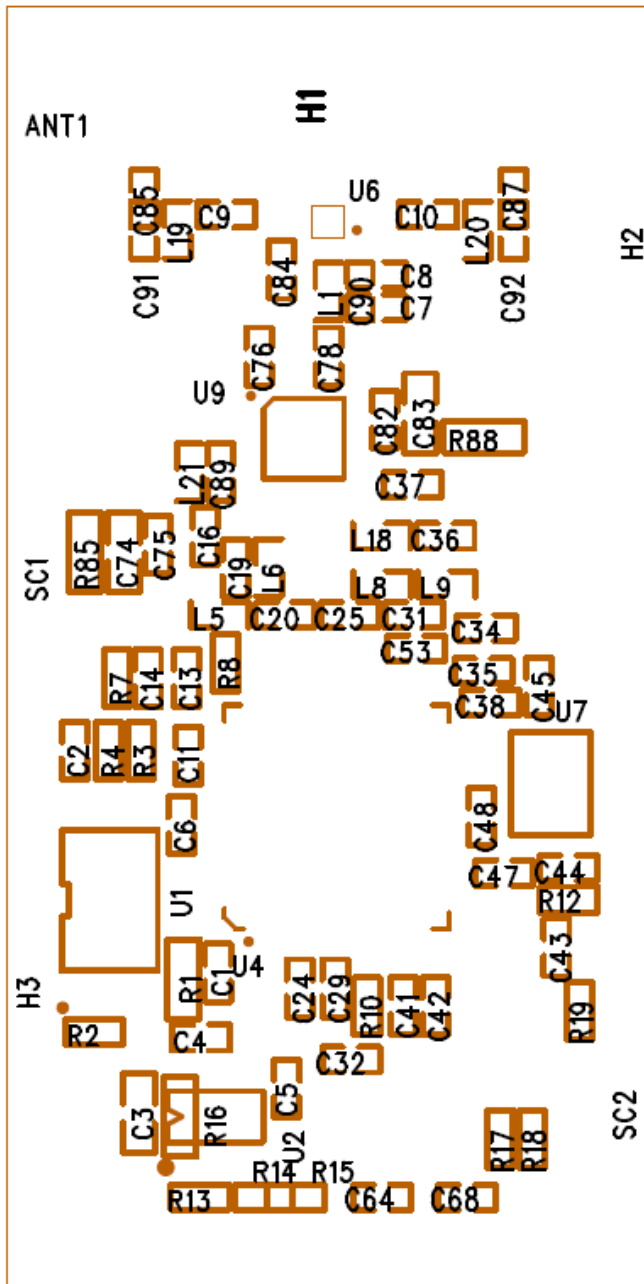
Fig 6.1 Mechanical Drawing of S83D-E Module

- ◆ Propose 1.27mm Female Header size : H: $4.3 \pm 0.15$ mm W: $3.0 \pm 0.15$ mm









## 7. Block Diagram

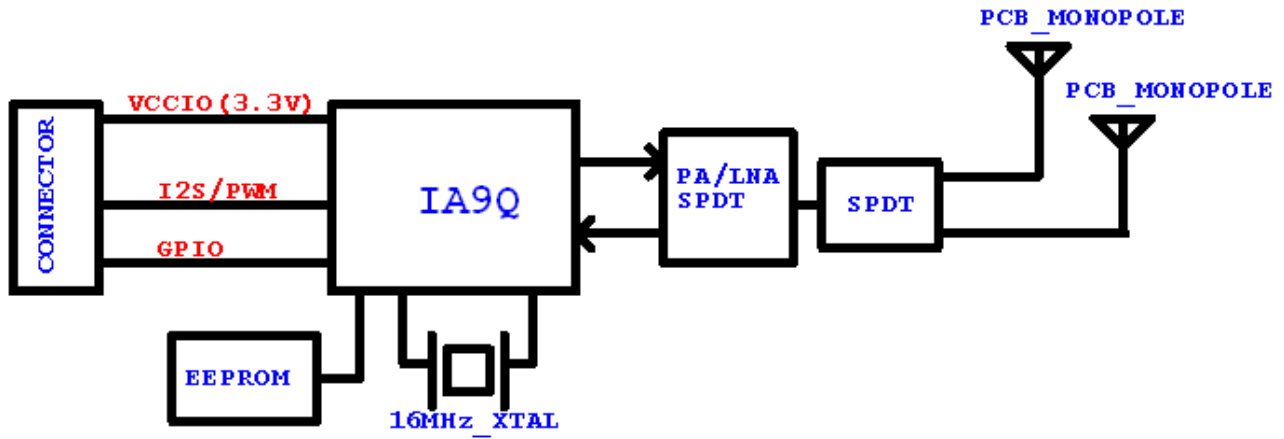


Fig 7.1 Block Diagram of IA9Q5 S83D-E Module

## 8. Interface

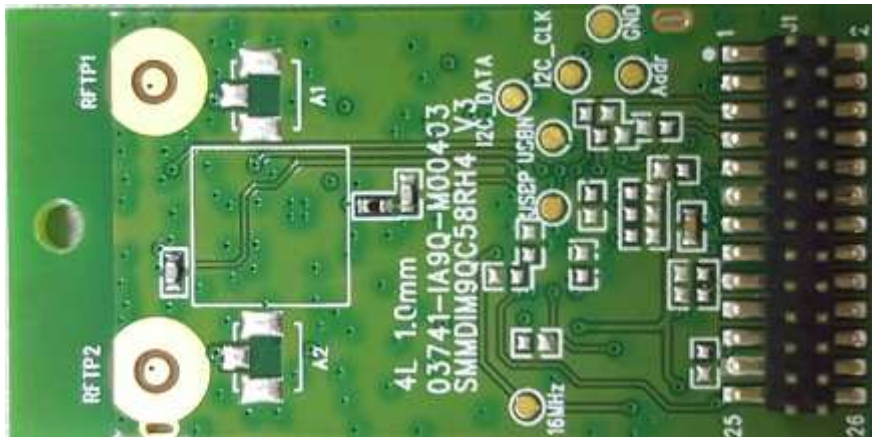


Fig 8.1 Pin sequence of S83D-E Module (Bottom View)

Pin	Name	I/O	TX Function Define	RX Function Define
1	VCCIO	P	DC 3.0 ~ 3.6V IN	DC 3.0 ~ 3.6V IN
2	DGND	P	Digital GND	Digital GND
3	SPB_I2S_MCLK	I/O	SPB I2S audio MCLK system clock output	SPB I2S audio MCLK system clock output
4	GPIO 32	I/O	GPIO	AMP MUTE
5	GPIO 14	I/O	GPIO	GPIO
6	GPIO 31	I/O	GPIO	GPIO
7	GPIO 17	I/O	GPIO	GPIO
8	GPIO 36	I/O	I2C_BUSY , Module Pull High	I2C_BUSY , Module Pull High
9	I2C_CLK	I/O	I2C Master/Slave clock signal	I2C Master/Slave clock signal
10	I2C_DATA	I/O	I2C Master/Slave data signal	I2C Master/Slave data signal
11	DGND	P	Digital GND	Digital GND
12	DGND	P	Digital GND	Digital GND
13	GPIO 27	I/O	GPIO	Pairing
14	GPIO 21	I/O	GPIO	GPIO
15	GPIO 16	I/O	GPIO	ON/OFF 12V
16	GPIO 34	I/O	I2S Master/Slave Select	I2S Master/Slave Select
17	M_RESET(PORN)	I/O	Internal power on reset (1)	Internal power on reset (1)
18	I2C_CLK	I/O	I2C Master/Slave clock signal	I2C Master/Slave clock signal
19	I2C_DATA	I/O	I2C Master/Slave data signal	I2C Master/Slave data signal
20	GPIO 30	I/O	GPIO	AMP RESET(L Act)
21	SPA_I2S_DATA	I/O	I2S DATA 0	SYNC LED
22	SPB_I2S_LRCK	I/O	SPB I2S audio LRCK	SPB I2S audio LRCK
23	DGND	P	Digital GND	Digital GND
24	SPB_I2S_BCK	I/O	SPB I2S audio BCK	SPB I2S audio BCK
25	GPIO 15	I/O	GPIO	ON/OFF 3.3V
26	SPB_I2S_DATA	I/O	SPB I2S audio Data	SPB I2S audio Data

Table 8 IO Function Define

- Note : (1) \* .Not need external RC circuit to do RC reset  
 \*.Power On Reset Characteristics can reference section 5 Electrical Specification (page 6)  
 \*.External controller can direct control M\_RESET but should assign the control IO as input for normal operation and output low to Reset S83D-E Module

## 9. Design Reference

### 9.1 ADC/DAC Reference Design

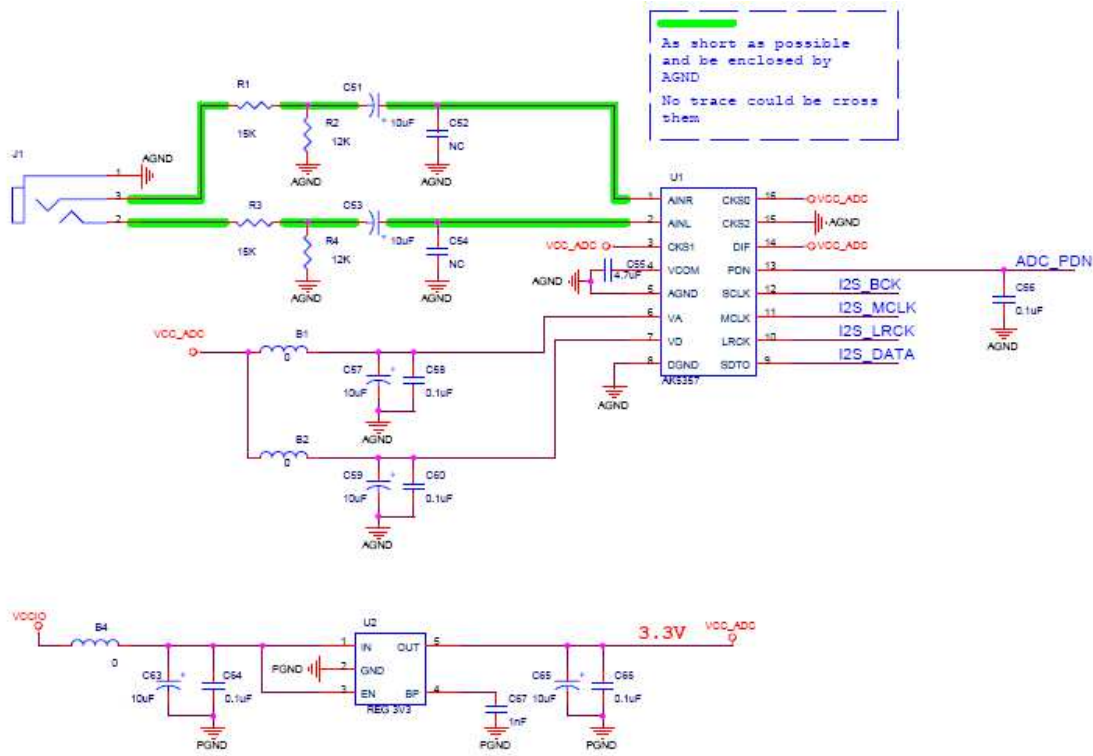


Fig 9.1 ADC reference design circuit

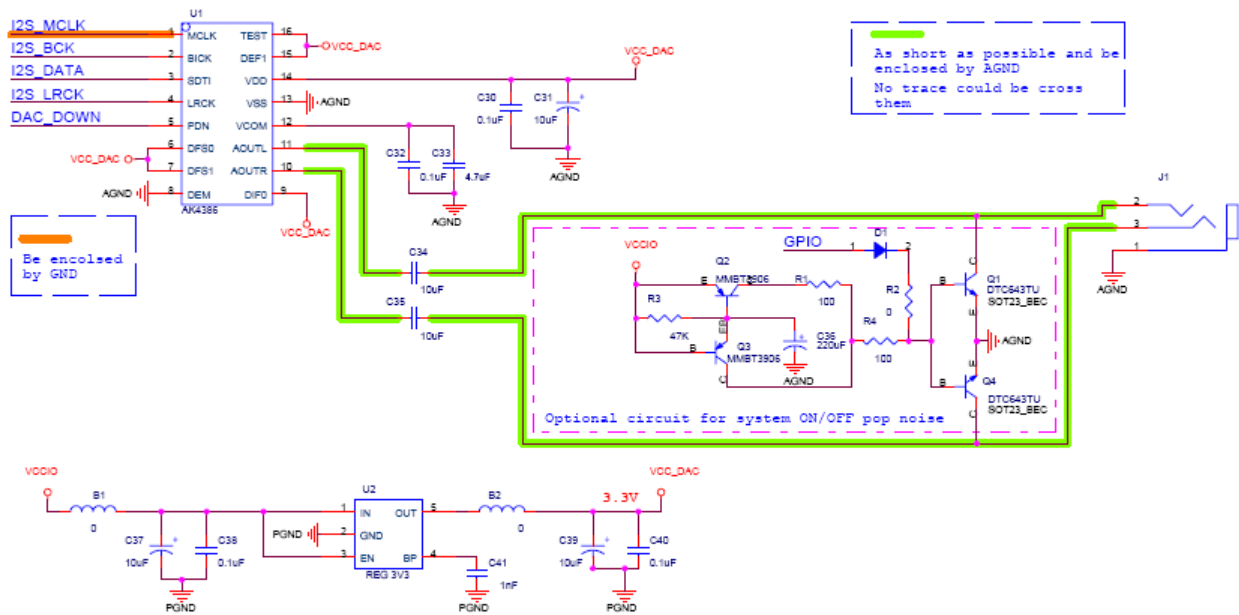


Fig 9.2 DAC reference design circuit

## 9.2 I2S Timing Chart

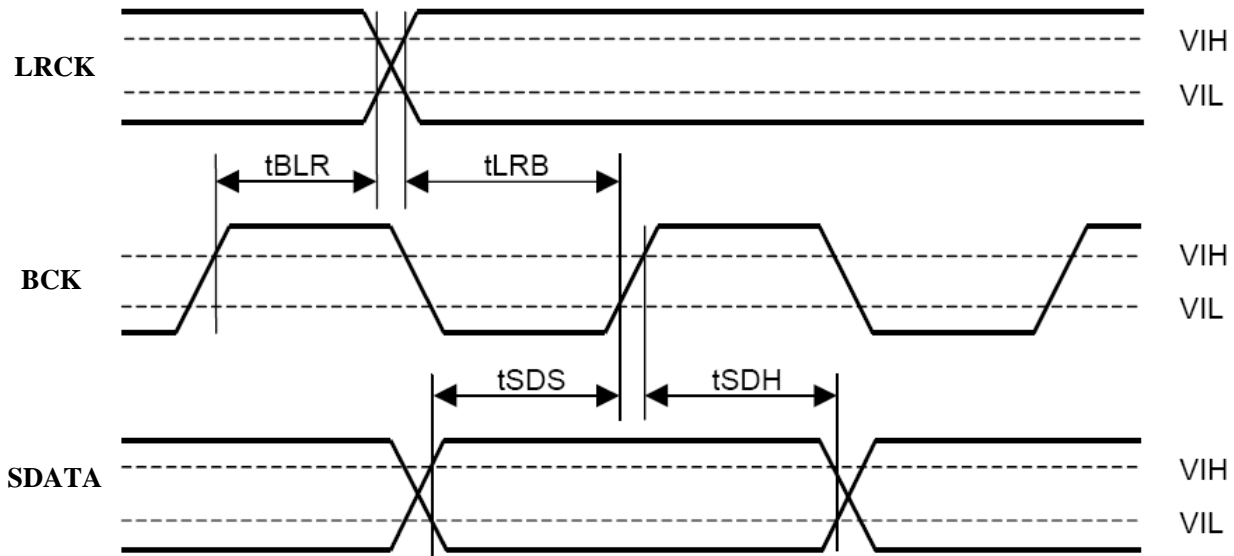


Fig 9.3 I2S timing chart

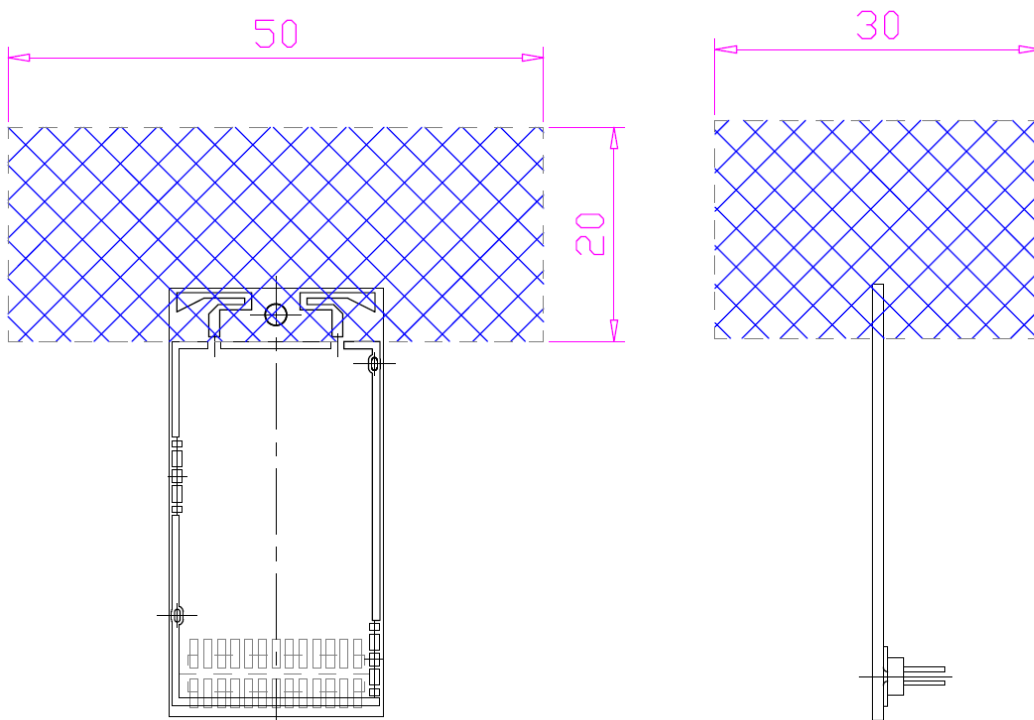
Symbol	Parameter	Min	Typ	Max	Unit
tBLR	BCK rising to LRCK edge	60			ns
tLRB	LRCK edge to BCK rise	60			ns
tSDS	SDATA setup time	60			ns
tSDH	SDATA hold time	60			ns

Table 9

## 10. Antenna Application

### 10.1 Suggested Clear Area

*The recommended antenna clearance for embedded PCB antennas are shown below. Note that this clearance should be maintained when mounting the module on a motherboard.*

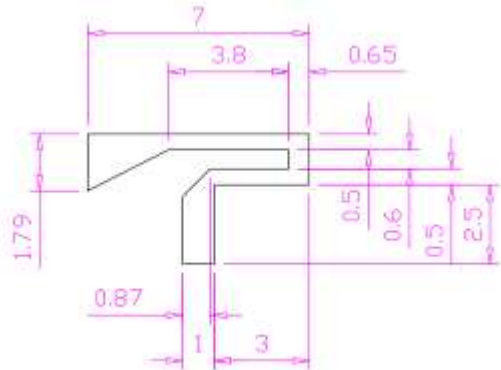


Unit : mm

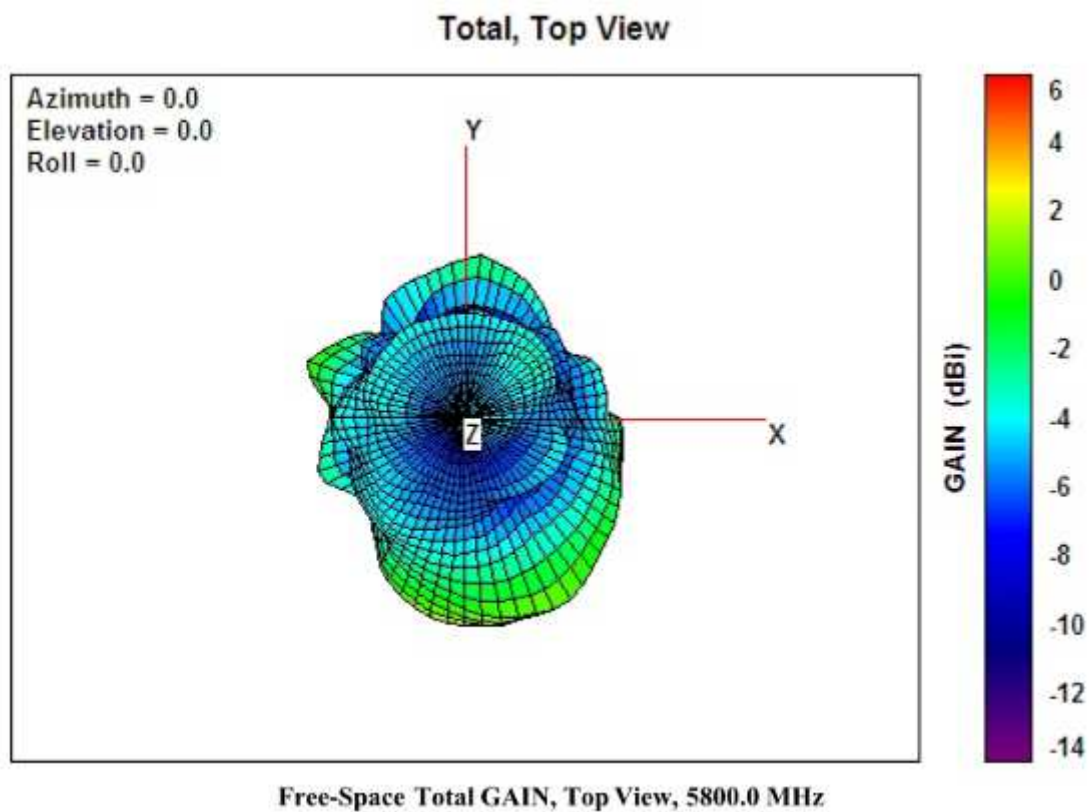
*Do not place any copper, metal or even PCB  
in the area marked with cross lines.*

Fig 10.1 Antenna Clearance Recommendations from Top and Side View

## 10.2 Antenna Drawing

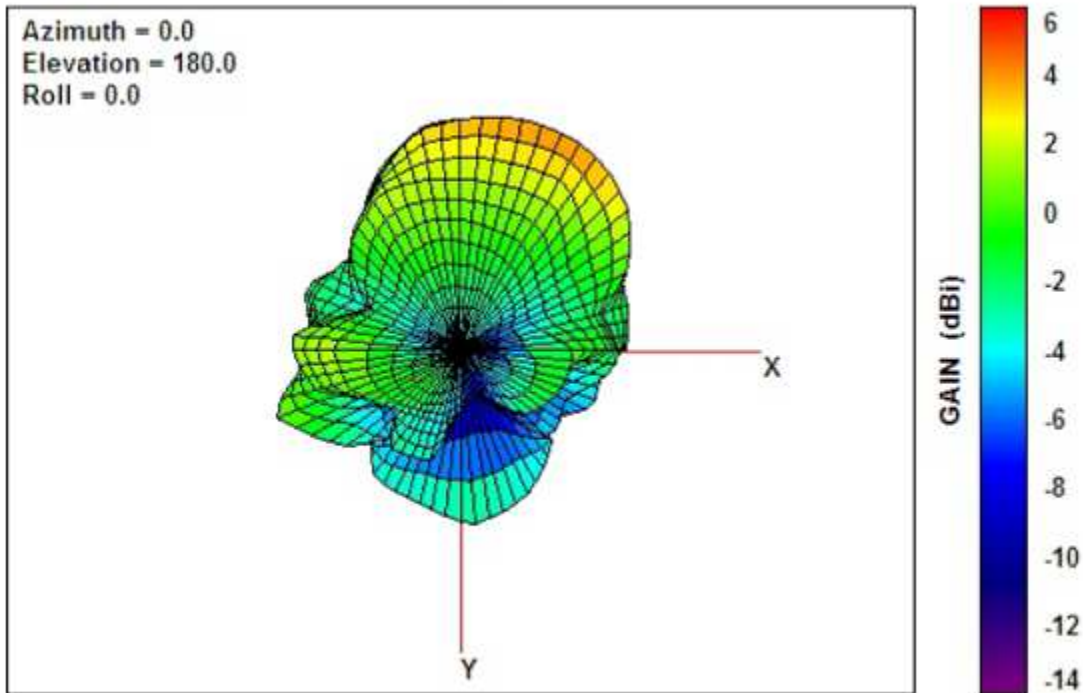


## 10.3 Antenna Pattern



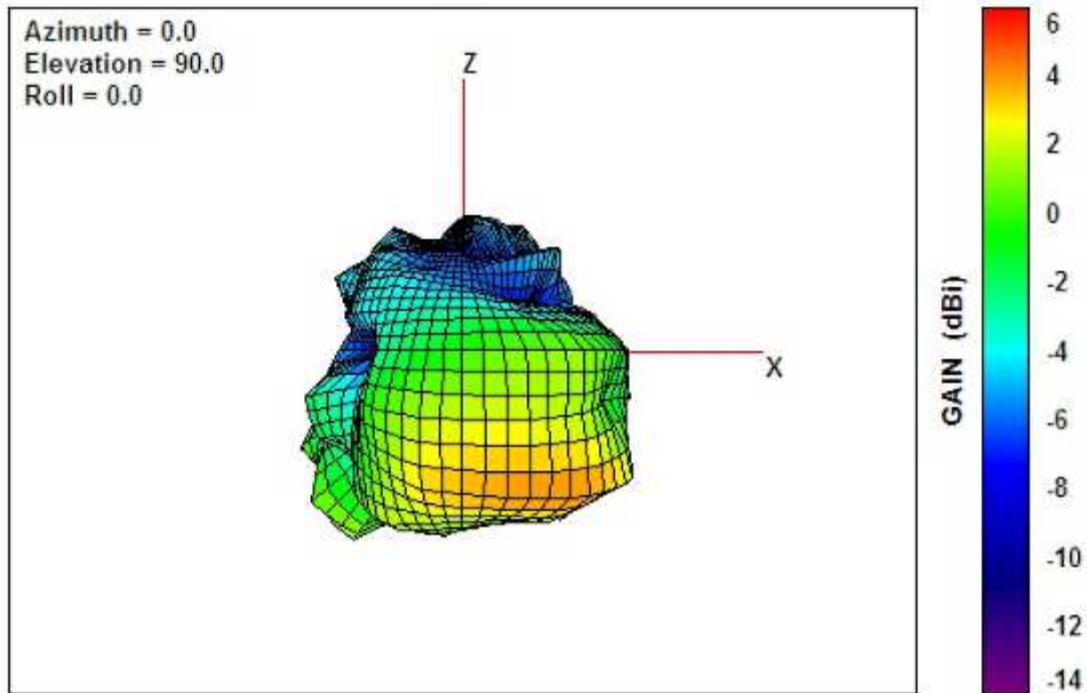


**Total, Bottom View**



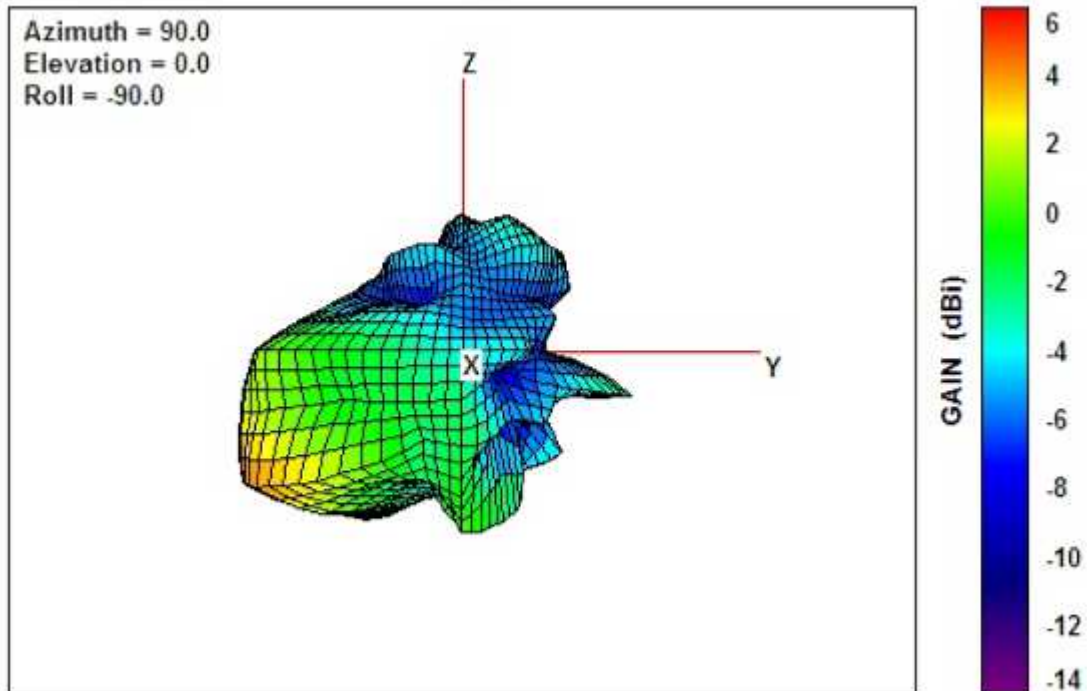
Free-Space Total GAIN, Bottom View, 5800.0 MHz

**Total, Back Face View**



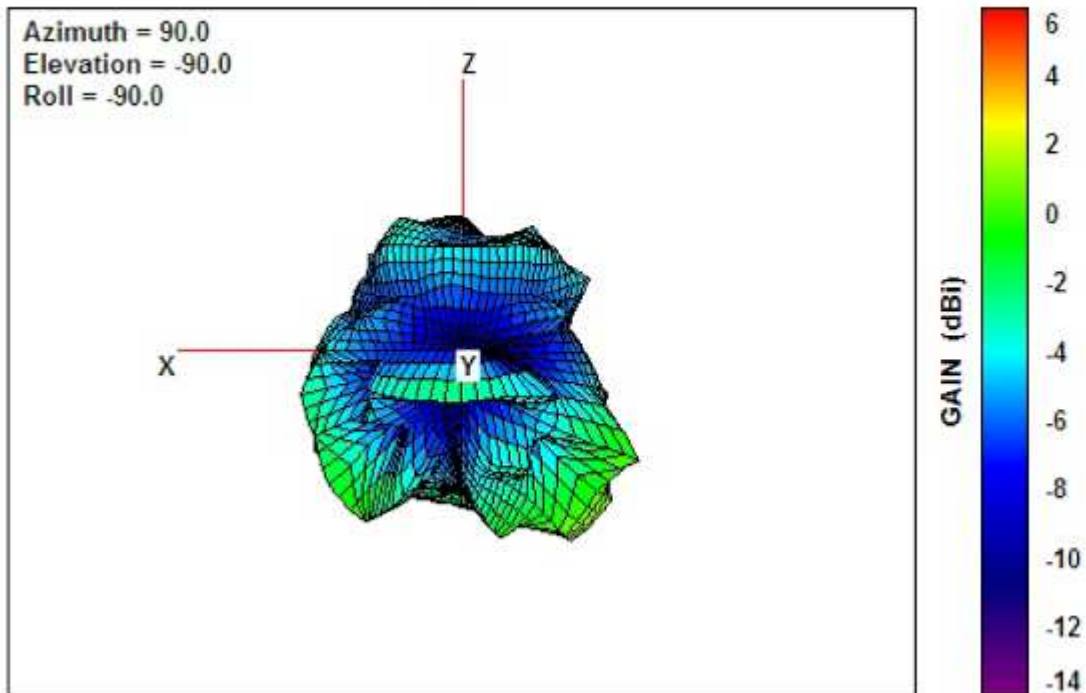
Free-Space Total GAIN, Back Face View, 5800.0 MHz

**Total, Left Side View**

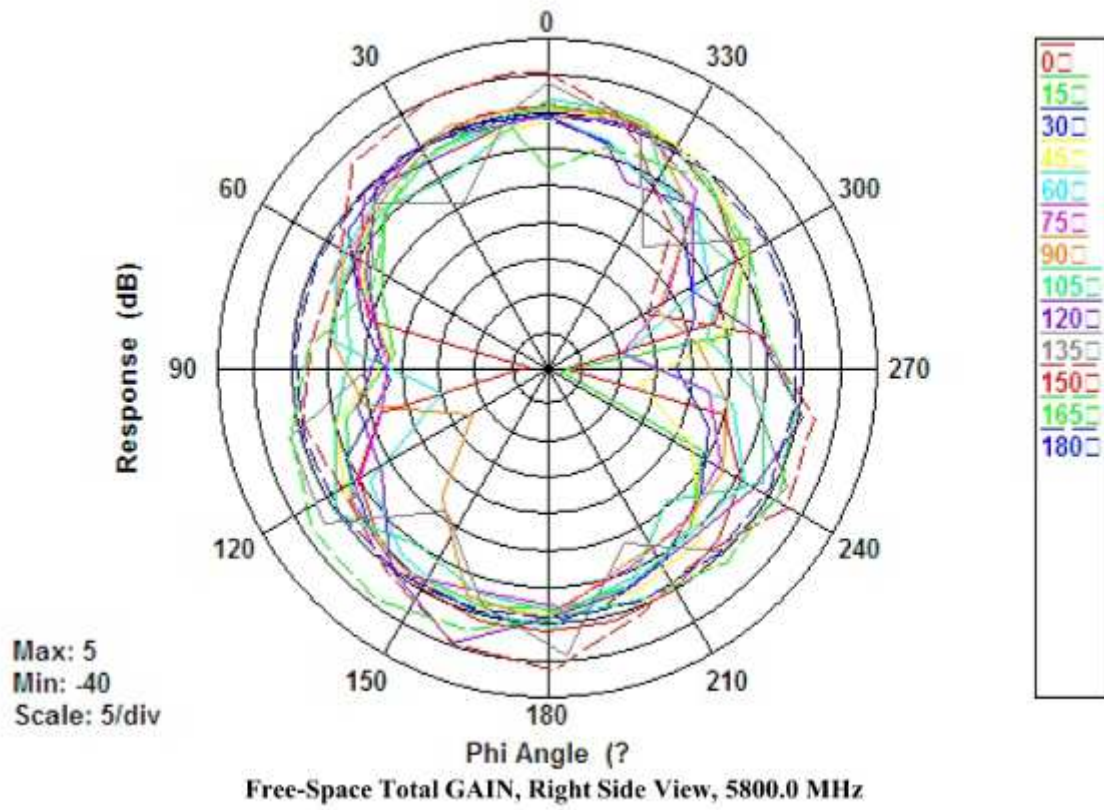


Free-Space Total GAIN, Left Side View, 5800.0 MHz

**Total, Front Face View**



Free-Space Total GAIN, Front Face View, 5800.0 MHz



Max Antenna Gain : 2.85 dBi

## 11. Ordering Information

Feature Model Name	Antenna		Shielding Case		Clip		Ordering Info.	
	PCB	<b>MHF</b>	Without	With	Without	With	Part Number	Description
Model M		●	●		●			IA9Q5 S83D-E Model M TX
Model MC		●	●			●		IA9Q5 S83D-E Model MC TX
Model MS		●		●	●			IA9Q5 S83D-E Model MS TX
Model MSC		●		●		●		IA9Q5 S83D-E Model MSC TX
Model P	●		●		●		1A5UI-IA9Q-24T101	IA9Q5 S83D-E Model P TX
Model PC	●		●			●		IA9Q5 S83D-E Model PC TX
Model PS	●			●	●			IA9Q5 S83D-E Model PS TX
Model PSC	●			●		●	1A5UI-IA9Q-25T101	IA9Q5 S83D-E Model PSC TX

Note: Model Name is the abbreviation of Feature column which is written in bold.

For example **P** is the abbreviation of **PCB** antenna

Table 10

## 12. Revision History

Date	Revision	Descriptions
2017/07/13	0.1	First release
2017/08/15	0.2	Add Mechanical picture

Table 11

The frequency block is 5725Mhz~5850MHz

Operating Temperature:0° ~55° C

Output power: 13.5dBm

The device is restricted to indoor use when operated in the European Community using frequency in 5725Mhz~5850MHz to reduce the potential for interference.

Restriction in BE, BG, CZ, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, PT, RO, SI, SK, FI, SE, UK.

#### RF exposure statement

RF exposure information: The Maximum Permissible Exposure (MPE) level has been calculated based on a distance of d=20cm between the device and the human body. To maintain compliance with RF exposure requirement, use product that maintain a 20cm distance between the device and human body.

#### Declaration of Conformity

Hereby, SYNCOMM TECHNOLOGY CORP declares that the radio equipment type RF 5G Wireless Module is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address:

<http://www.syncomm.com.tw/index.php/sc/2013-07-31-08-36-54-2>

## **FCC Statement**

### **15.19**

1. 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.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

### **15.21**

Note: The grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

### **15.105(b)**

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 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 or more 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

## **RF 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 of 20 cm between the radiator and your body.

### **FEDERAL COMMUNICATIONS COMMISSION (FCC) STATEMENTS**

The RF 5G Wireless

Module complies with Part 15 of the United States of America FCC rules and regulations. The Original Equipment Manufacturer (OEM) must comply with the FCC certification requirements.

15.21 Any changes or modifications made to the module without the manufacturer's approval could void the user's authority to operate the module.

## ORIGINAL EQUIPMENT MANUFACTURER (OEM) NOTES

- The OEM must certify the final end product to comply with unintentional radiators (FCC Sections 15.107 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.
- The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: **PJH-IA9Q5S83D-E**". Additionally, the following statement should be included on the label and in the final product's user manual: "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 interferences, and (2) this device must accept any interference received, including interference that may cause undesired operation."

This Module is full modular approval, it is limited to OEM installation ONLY.