Bluetooth Module Datasheet

Model No.型号:TBM-QCC307B

版本 Version：V1.0

公布日期 Release Date: 2016-03-08

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版本变更说明 Document Revision History

Revision 版本	Date 日期	Author 作者	Checked by 审核	Description 描述
V1.0	2018-8-18	huangzisheng	liweixiong	First release.

目录 Table of Contents

1. 系统概览 System overview

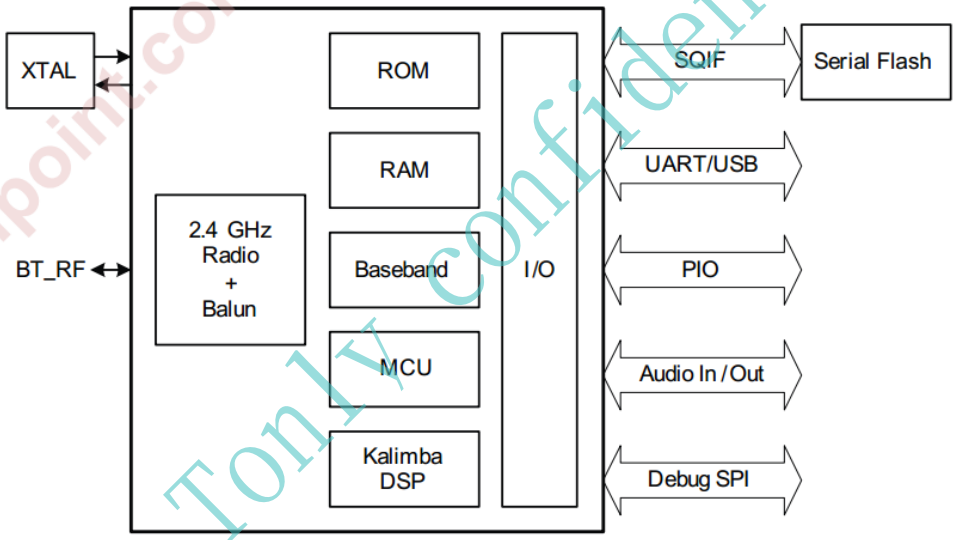
1.1 通用说明 General Descriptions

The QCC3007 module is a single-chip flash programmable dual mode Bluetooth v5.0 device with integrated application processor, low-power audio DSP, on-chip ROM and RAM, stereo codec, battery charger, switch-mode and linearregulators, and LED drivers.

1.2 性能特点 Features

- Bluetooth ® v5.0 specification compliant
- Multipoint support for A2DP connection to 2A2DP sources for music playback
- Stereo line-in
- True Wireless Stereo (TWS)
- Low Power Consumption
- Supported Bluetooth Profiles：A2DP v1.3.1， AVRCP v1.6,HFP v1.7, GAIA, EQs.

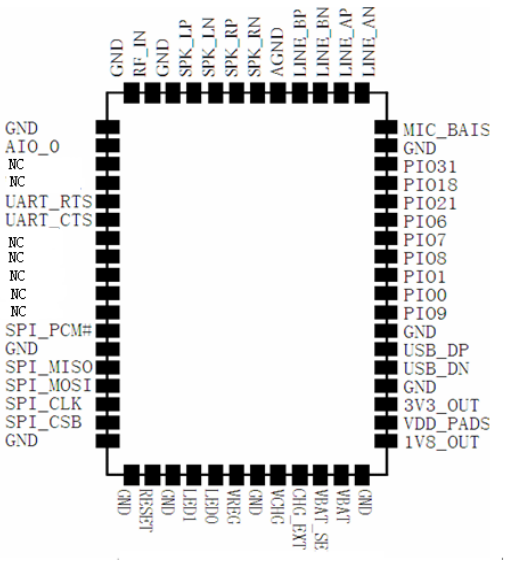
1.3 系统方框图Block Diagram



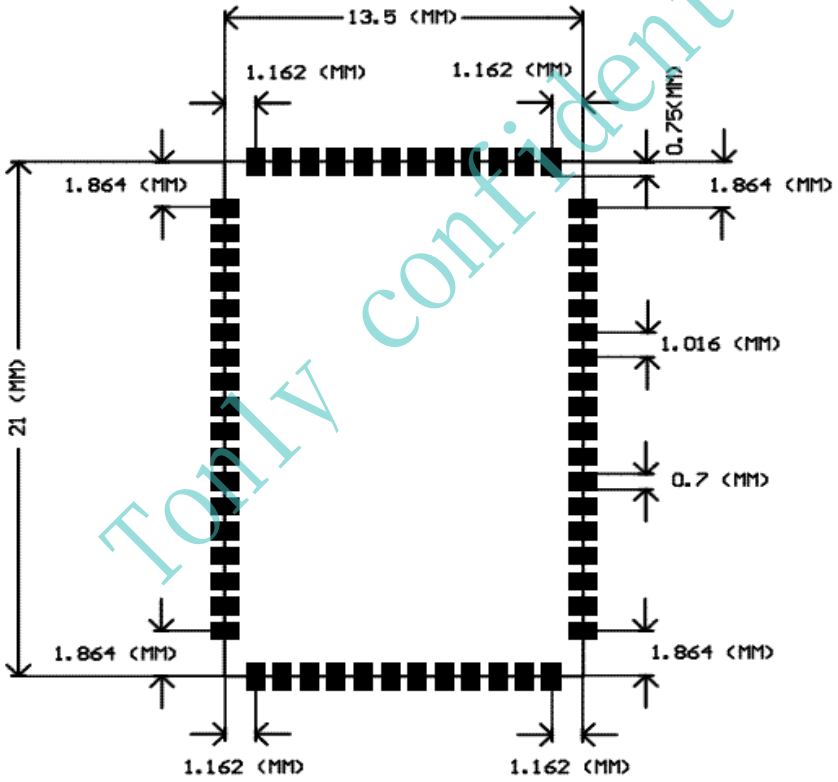
2.产品描述 Production Description

引脚与功能说明 Apperance & Pin Description& Physical Dimensions

- Description & Apperance:



- **Physical Dimensions**



Pin descriptions

PIN NO.	Symbol	Description	Function
1、18、19 、21 、25 、	GND	Power supply and control	Ground connections.

30、33、37、47、58			
2	AIO0	Bi-directional with programmable analog I/O.	Analogue Programmable I/O
5	UART_RTS	A CMOS output with a weak internal pull-up. This pin can be used to implement RS232 hardware flow control where RTS (request to send) is an active low indicator. The UART interface requires an external RS232 transceiver chip.	UART request to send, active low Alternative function: PIO16: Programmable input / output line 16. Bidirectional with strong pull-up
6	UART_CTS	A CMOS input with a weak internal pull-down. This pin can be used to implement RS232 hardware flow control where CTS (clear to send) is an active low indicator. The UART interface requires an external RS232 transceiver chip.	UART clear to send, active low; Alternative function: PIO17: Programmable input / output line 17.Bidirectional with strong pull-down. Bidirectional with strong pull-down
3、4、7、8、9、10、11	NC	Leave unconnected	NC
12	SPI_PCM#	Configurated PCM/I2S digital audio interface shares the same physical set of pins with the SPI interface. SPI_PCM# is a CMOS input with a weak internal pull-down. When inputs HIGH level, this set of pins is used For SPI interface. When inputs LOW level, this set of pins is used for PCM/PIO/I2S interface.	SPI/PCM select input: 0 = PCM/PIO interface 1 = SPI
14	SPI_MISO	Programmable I/O line or debug SPI MISO selected by SPI_PIO#.	SPI data output
15	SPI_MOSI	Programmable I/O line or debug SPI MOSI selected by SPI_PIO#.	SPI data output
16	SPI_CLK	Programmable I/O line or debug SPI	SPI CLOCK

		CLK selected by SPI_PIO#.	
17	SPI_CSB	Programmable I/O line or debug SPI chip select (CSB) selected by SPI_PIO#.	chip select for SPI, active low
20	RESET	The RESET pin is an active high reset and is internally filter educing the internal low frequency clock oscillator .A reset will be performed between1.5 and 4.0ms following RESET being active.	Reset if low. Pull low for minimum 5ms to cause a reset.
22	LED_1	Bidirectional	Programmable Input/Output Line & LED driver
23	LED_0	Bidirectional	Programmable Input/Output Line & LED driver
24	POWER_VREG	Enable pin for the internal 1.8V regulator, This pin is only available with production version	Regulator enable input. Can also be sensed as an input. Regulator enable and multifunction button. A high input (tolerant to VBAT) enables the on-chip regulators, which can then be latched on internally and the button used as a multifunction input.
26	VBUS	Power supply and control	Charger input. Typically connected to VBUS (USB supply)
27	CHG_EXT	Power supply and control	External battery charger control. External battery charger transistor base control when using external charger boost. Otherwise leave unconnected.
28	VBAT_SENSE	Power supply and control	Battery charger sense input. Connect directly to the battery positive pin.
29	VBAT	Input for an internal 1.8V switched mode regulator combined with output of the internal battery charger.	Battery charger input

31	1.8V_OUT	Power supply and control	1.8V DC/DC convertor output.
32	VDD_IO	Power supply and control	Positive supply input for input/output ports.
33	3V3_OUT	Power supply and control	3.3V bypass linear regulator output. Also supply for USB port.
35	USB_DN	Abi-directional USB data line with a selectable internal 1.5kΩ pull-up implemented as a current source (compliant with USB specification v2.0) An external series resistor is required to match the connection to the characteristic impedance of the USB cable.	USB data minus.
36	USB_PN	A bi-directional USB data line. An external series resistor is required to match the connection to the characteristic impedance of the USB cable.	USB data plus with selectable internal 1.5kΩ pull-up resistor.
38	PIO_9	programmable analog I/O.	Programmable I/O.
39	PIO_0	programmable analog I/O.	Programmable I/O.
40	PIO_1	programmable analog I/O.	Programmable I/O.
41	PIO_8	programmable analog I/O.	Programmable I/O.
42	PIO_7	programmable analog I/O.	Programmable I/O.
43	PIO_6	programmable analog I/O.	Programmable I/O.
44	PIO_21	programmable analog I/O.	Programmable I/O.
45	PIO_18	programmable analog I/O.	Programmable I/O.
46	LED_2	Bidirectional	Programmable input / output line & LED driver.
48	BIAS	Microphone bias	Microphone bias
49	LINE_AN	Analogue in	Line or microphone input negative, channel A
50	LINE_AP		Line or microphone input positive, channel A
51	LINE_BN	Analogue in	Line or microphone input negative, channel B
52	LINE_BP		Line or microphone input positive, channel B

53	AGND	Connect Analog Ground pins	Analogue Ground connections.
54	SPK_RN	Analogue out	Speaker output negative, right
55	SPK_RP		Speaker output positive, right
56	SPK_LN	Analogue out	Speaker output negative, left
57	SPK_LP		Speaker output positive, left
59	RF	This pin can be used when not using a chip antenna or connector of the module.	Bluetooth 50Ω transmitter output / receiver input

3.应用说明 Application Explanations

- Bluetooth stereo speakers
- Speakerphones

4. 电气特性 Electrical Characteristics

Base Characteristics

ELECTRICAL CHARACTERISTICS	
Supply Voltage	1.8 – 3.6V DC (Absolute Maximum Ratings1.8-4.2V)
Working current	Depends on profiles, 13mA (A2DP)
Standby current(disconnected)	1.05mA~3.1mA
WEIGHT AND DIMENSIONS	(unit : mm)
Size (L x W x H)	21*13.5*1.5 mm
Weight	0.9g

Recommended operating conditions

	Min	Max	Unit
Operating temperature	-40	85	°C
VDD_IO	1.7	3.6	V
VDD_BAT	2.8	4.4	V
VDD_CHG	0	5.5	V
Terminal voltages	0	VDD	V

电池充电 Battery charger

Item	Min	Type	Max	Unit

Input Voltage	4.5	5	5.75	V
Charge Current(CC mode)	194	200	206	mA
Trickle Charge Current		10		mA
Trickle Charge Threshold Voltage		2.92		V
Regulated Output(Float)Voltage		4.2		V

Stereo CODEC Analogue to Digital Converter						
Parameter	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Resolution			-	-	16	Bits
Input Sample Rate,			8	-	48	kHz
Signal to Noise Ratio, SNR	fin=1kHz B/W=20Hz→20kHz A-Weighted THD+N<0.1% 1.6Vpk-pkinput	Fsample				
		8kHz	-	95.3	-	dB
		16kHz	-	93.8	-	dB
		32kHz	-	94.2	-	dB
		44.1kHz	-	92.4	-	dB
		44.1kHz	-	91.8	-	dB
Digital Gain	Digital Gain Resolution=1/32		-24	-	21.5	dB
Analogue Gain	Analogue Gain Resolution=3dB		-3	-	42	dB
Maximum ADC Input			13	2260	-	mVrms
3dBBandwidth			-	20	-	kHz

Stereo CODEC Digital to Analog Converter						
Parameter	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Resolution			-	-	16	Bits
Input Sample Rate,Fsample			8	-	96	kHz
Signal to Noise Ratio, SNR	fin=1kHz B/W=20Hz→20kHz A-Weighted THD+N<1% 0dBFSinput	[illegible]				
		48KHz Load=100K	-	95.6	-	dB
Digital Gain	Digital Gain Resolution=1/32		-24	-	21.5	dB
Analogue Gain	Analogue Gain Resolution=3dB		[illegible]	-	0	dB
Output voltage full scale swing(differential)			-	-	778	mVrms
THD+N100kΩ load			-	-	0.003	%
THD+N16Ω load			-	-	0.0032	%

5.射频性能 RF Performance

Specification	Description
RF performance	
Standard	Bluetooth 5.0

Frequency Band	2.402~ 2.48GHz
Modulation Method	GFSK；4/ΠDQPSK;8DQPSK
Maximum Data Rate	1 Mbps/2 Mbps/3 Mbps
Antenna	External antenna
Interface	UART, PIO, AIO, SPI,PCM,SPI
Operation Range	>=10 meters(Free Space)
Sensitivity	-86dBm at 0.1% BER
RF TX Power	<=+10dBm

6.认证与法规信息 Certification& Regulation

The BQB Certification：

Bluetooth

Project Details

Project Name	TBM-QCC307 Bluetooth Module
Product Type	End Product
TCRL Version:	TCRL 2018-1
Referenced Qualified Design(s)	
Previously Qualified Design Used in this Qualification(s)	86101 95413
Listing Date	2018-12-25
Declaration ID	D043013
Product Listing(s)	

Name	Website	Category	Publish Date	Model Number	Description
TBM-QCC307 Bluetooth Module	www.tonlyele.com	Audio and Visual	12/25/2018 12:00:00 AM	TBM-QCC307	Bluetooth Module.

Member Company	TCL Technoly Electronics (Huizhou) Co., Ltd.

FCC

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.

7.包装与订货说明 Package & Ordering Information

Assembly

- 60Pcs per every Blister tray
- 600Pcs per every Vacuum packing

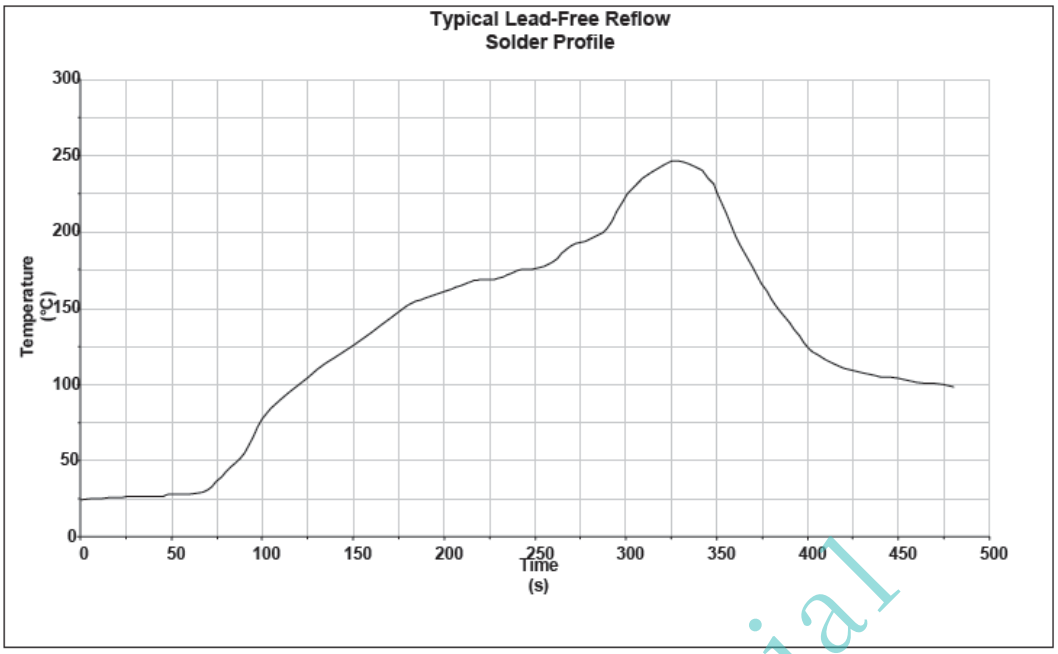

8.环保声明 Green Policy

This module can meet ROHS&REACH compliance.XXXX

9.推荐过炉温度 RECOMMENDED TEMPERATURE REFLOW PROFILE

The soldering profile depends on various parameters necessitating a set up for each application. The data here is given only for guidance on solder re-flow. There are four zones:

1. Preheat Zone - This zone raises the temperature at a controlled rate, typically 1-2.5°C/s.
2. Equilibrium Zone - This zone brings the board to a uniform temperature and also activates the flux. The duration in this zone (typically 2-3 minutes) will need to be adjusted to optimize the out gassing of the flux.
3. Reflow Zone - The peak temperature should be high enough to achieve good wetting but not so high as to cause component discoloration or damage. Excessive soldering time can lead to inter metallic growth which can result in a brittle joint.
4. Cooling Zone - The cooling rate should be fast, to keep the solder grains small which will give a longer lasting joint. Typical rates will be 2-5°C/s.



Key features of the profile:

- Initial ramp = 1-2.5°C/sec to 175°C ±25°C equilibrium
- Equilibrium time = 60 to 180 seconds
- Ramp to maximum temperature (245°C) = 3°C/sec max.
- Time above liquidus temperature (217°C): 45-90 seconds
- Device absolute maximum reflow temperature: 260°C

10.抗静电保护 ESD Protection

Condition	Class	Max Rating
Human Body Model Contact Discharge per ANSI/ESDA/JEDEC JS-001	2	2 kV (all pins except CHG_EXT. CHG_EXT is rated at 1 kV)
Charged Device Model Contact Discharge per JEDEC/EIA JESD22-C101	III	500 V (all pins)

----------END----------

For FCC:

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.**
-

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

FCC RF Radiation Exposure Statement Caution: To maintain compliance with the FCC's RF exposure guidelines, place the product at least 20cm from nearby persons. The Module can be installed in Mobile or fix device only, and it can not be installed in any portable Device.

FCC Conditions

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.

This device complies with Part 15, Part 15.247 of the FCC Rules. The FCC ID for this device is ZVAMS000026.

If the FCC ID is not visible with the module is installed inside another device, then it must be still responsible for the FCC compliance requirement of the end product which referring to the enclosed module and it also must display a label, such as the following:
Contains Transmitter module FCC ID: ZVAMS000026 or contains FCC ID: ZVAMS000026
The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.
The end user manual shall include all required regulatory information / warning as shown in this manual, include: This product must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

The host Main unit is a SPHE8107H, It has 16Mb flash and needs 24.576MHz crystal of reference frequency. This chip is responsible to control DSP, Bluetooth, audio system and all the source of input Host .For the FCC certification, TBM-QCC307B is without shielding cover test, If the Host manufacturer adds a shield cover for the whole machine test, it needs to re-evaluate FCC spurious emission test and make C2PC.

RF Traces for antennas

The figure below shows the general breakout of the module U2:

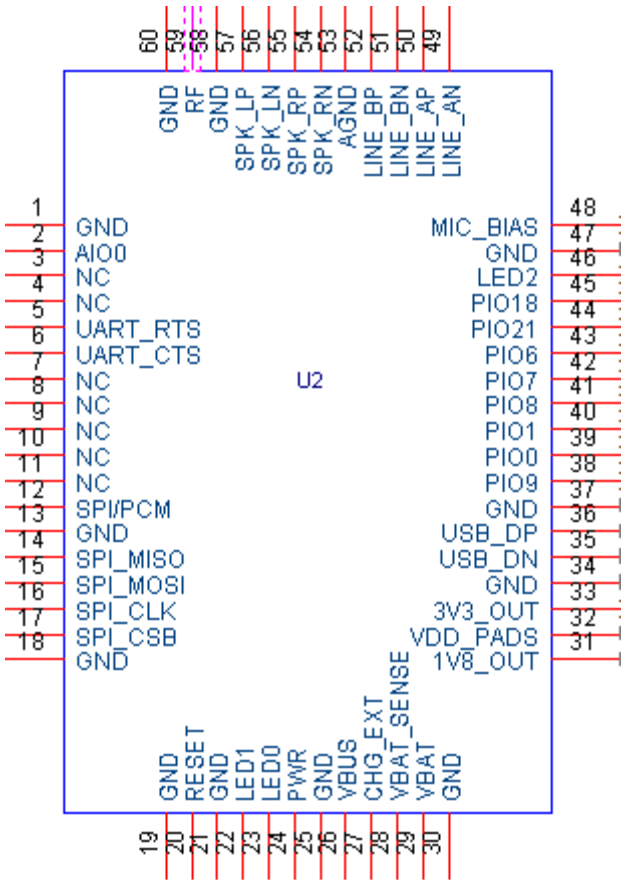


Figure 1-1

On U2 PCB board,A band-pass filter Fil1 needs to be inserted between QCC3007 power amplifier (PA) output and the antenna. This component can be added to provide additional margin for emissions testing. The band-pass filter should be located as close to QCC3007 QFN as possible. The grounding of the filter is critical to guarantee proper attenuation of the filter out of band. The layout of the RF section in a QCC3007 QFN system can affect overall RF performance. Ground connections become increasingly critical at RF frequencies. All ground pins should be connected to the main RF reference ground plane On the QCC3007 QFN only two of the RF grounds are routed to lead frames, the others are tied to the paddle underneath the die. See figure2-1

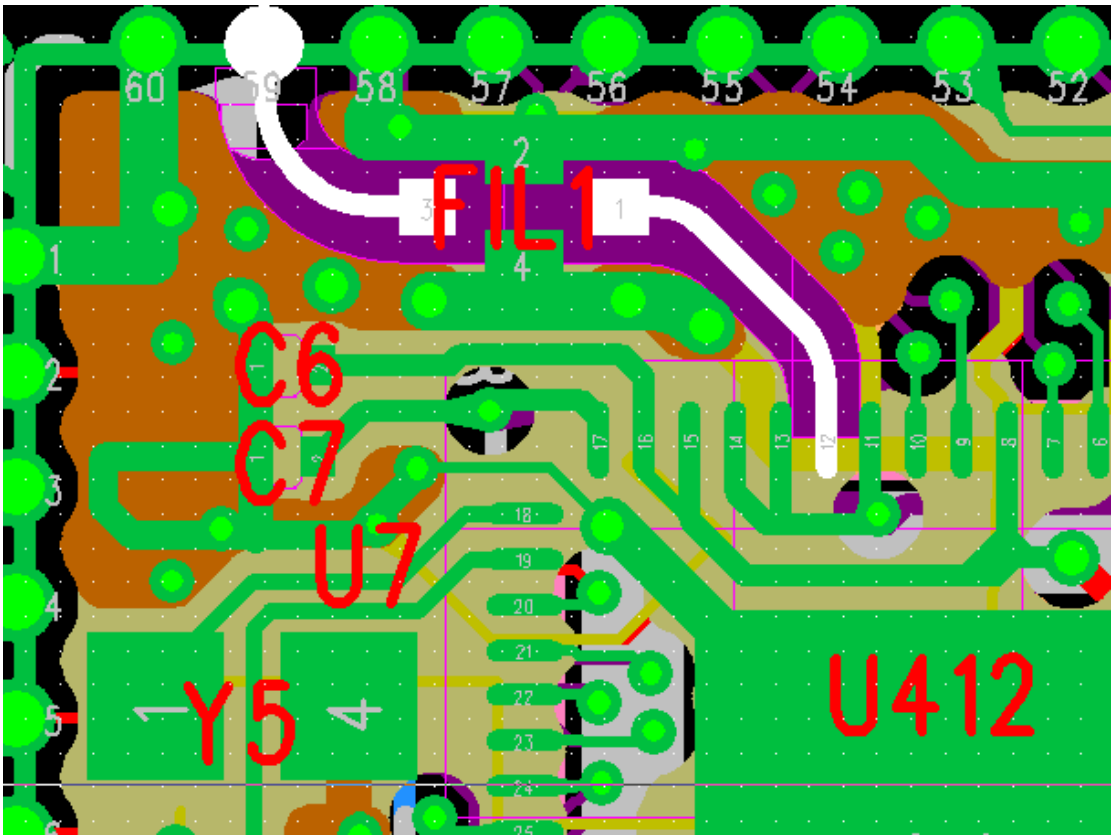


Figure 2-1

For routing microstrip lines UNDERNEATH the NAD on layer 1, these ground cutouts internal to the NAD need to be accounted for in the stripline calculation.
For example, consider the following stackup for a U2 PCB: Figure 3-1

Layer	Thickness (Millimeter)	Stackup Picture	Family	Description	Type
S1X			SolderMask	防焊油墨	
L1X	0.0150		CU	1oz ;残铜率:43.36%	SIGNAL
	0.1173		S1000HBPP	2116RC58%	
L2X	0.0350		CU	1oz ;残铜率:57.7%	SIGNAL
	0.5300		S1000H	53--------core---TG150	
L3X	0.0350		CU	1oz ;残铜率:53.26%	SIGNAL
	0.1157		S1000HBPP	2116RC58%	
L4X	0.0150		CU	1oz ;残铜率:72.54%	SIGNAL
S2X			SolderMask	防焊油墨	
	0.8630	**压合后厚度mm**			
	0.9000	**After Lamination**	**+0.0750**	**-0.0750**	
	0.1143	**L1X - L2X**	**+0.0114**	**-0.0114**	
	0.1143	**L3X - L4X**	**+0.0114**	**-0.0114**	

x 29.700 厘米

Figure 3-1

Assume the U2 PCB Board above with a 4 layer stackup with ground cut away on layer 2 so the microstrip lines reference ground on layer 3. The dielectric thickness from L1 to L3 is

26.74mils. Using an online impedance calculator, the line width under the NAD for a 53 ohm line is 16.87 mils .Figure 3-2

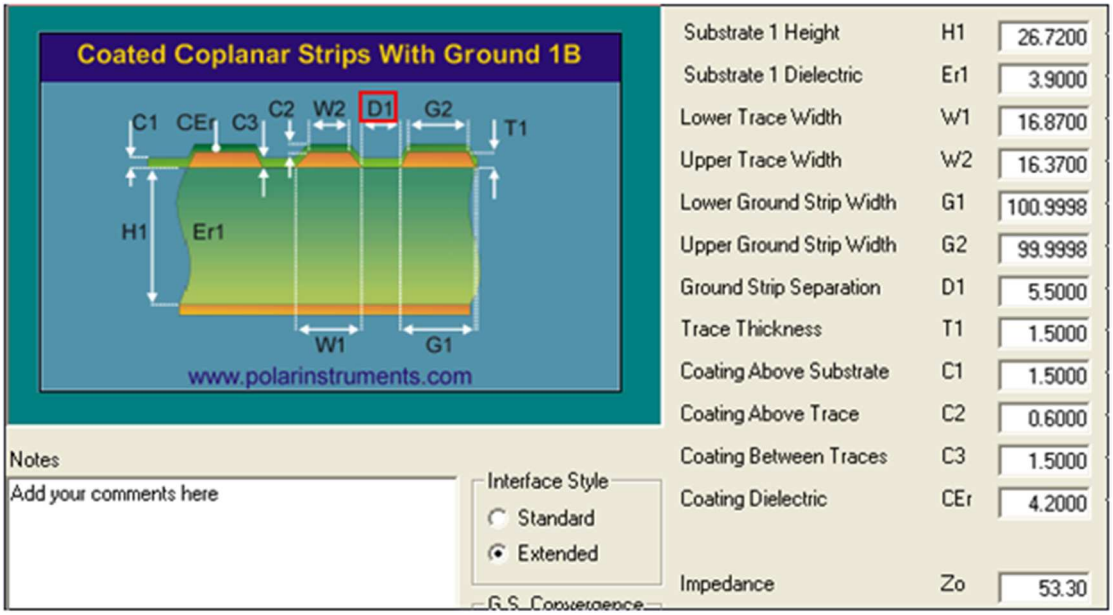


Figure 3-2

We can put in tray like for U2 SMD to 40-TMAX50-VFD2G. The PCB antenna on the design on 40-TMAX50-VFD2G is a Inverted F Antenna (IFA).(See Figure4-1) The IFA was designed to match an impedance of 50 ohm at 2.45 GHz. Antenna Gain ： **3.0dBi.** The antenna could require a matching network, It use the LC Circuit. R16 3.3nH C15 0.2Pf. See Figure4-2,4-3

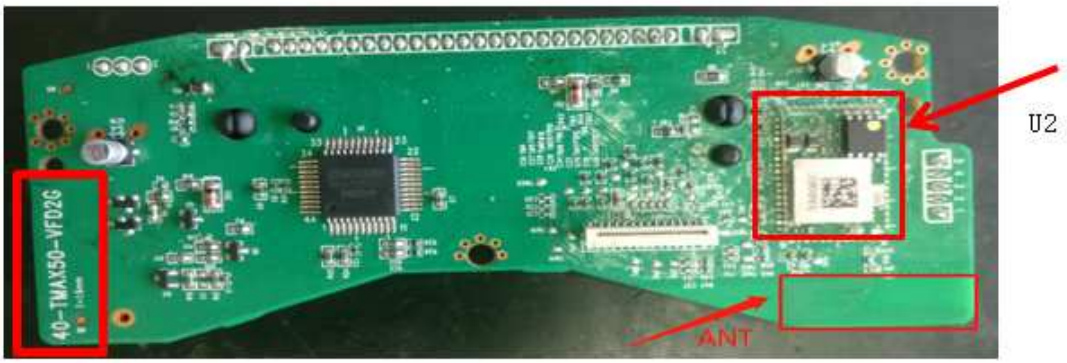


Figure4-1

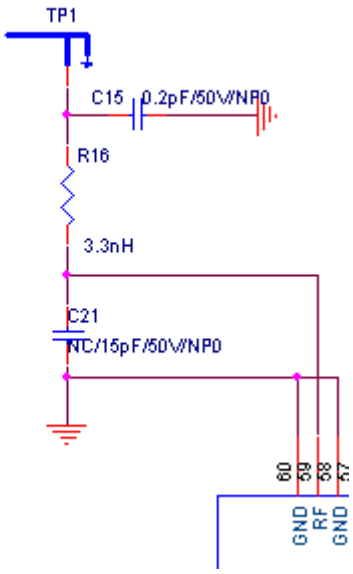


Figure 4-2

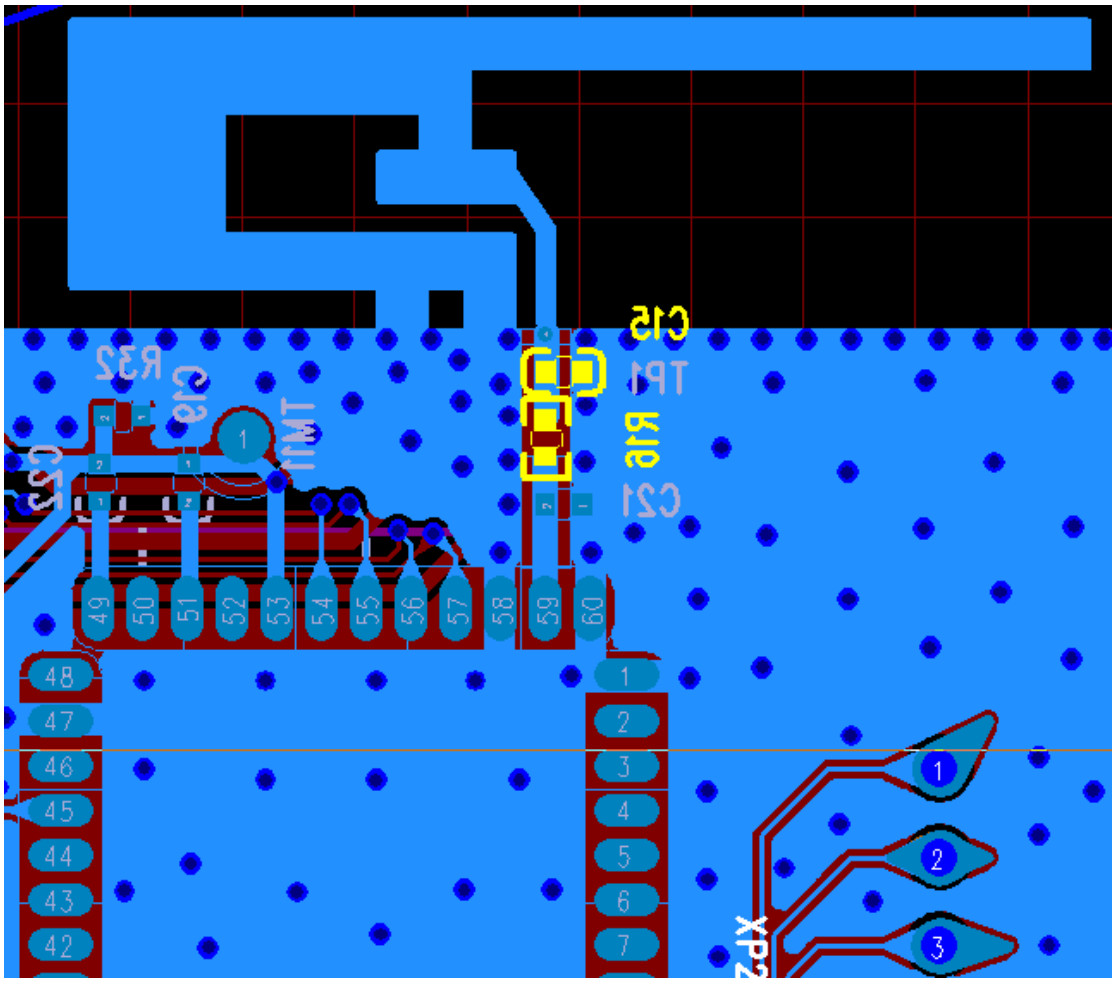


Figure 4-3

This 50ohm line(yellow)should be as short as possible to the IFA or

internal antenna feed point. See Figure 5-1

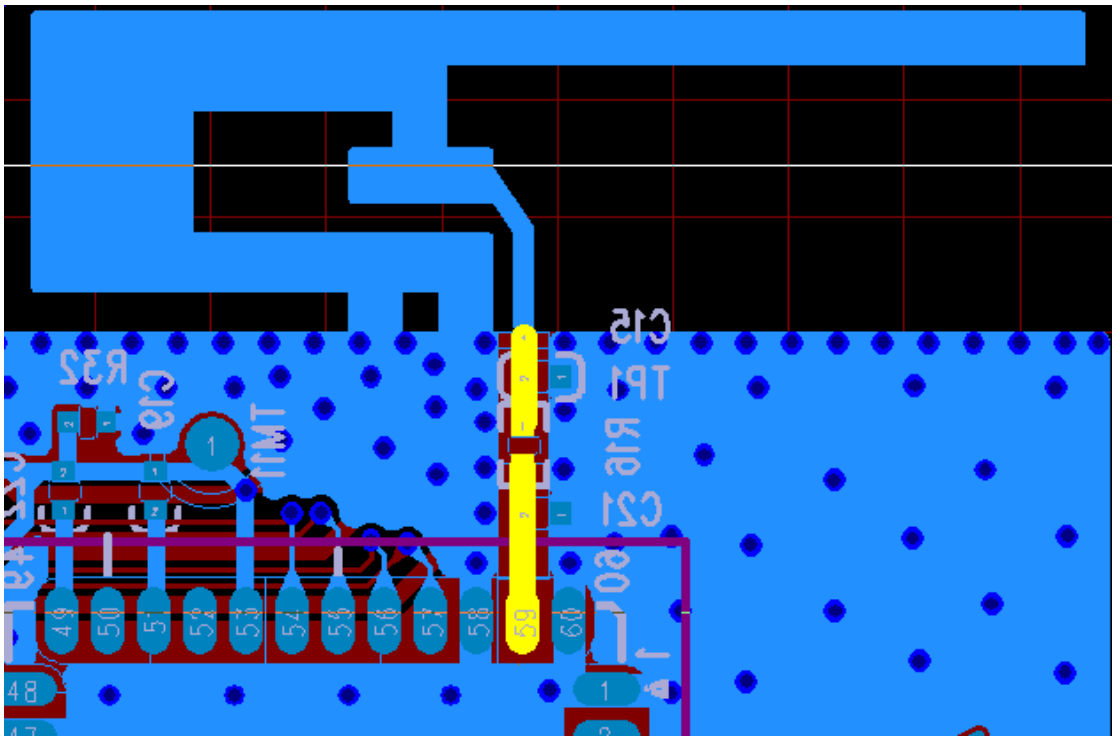


Figure 5-1

Mechanical Specifications of the Antenna. See Figure 6-1, Figure 6-2

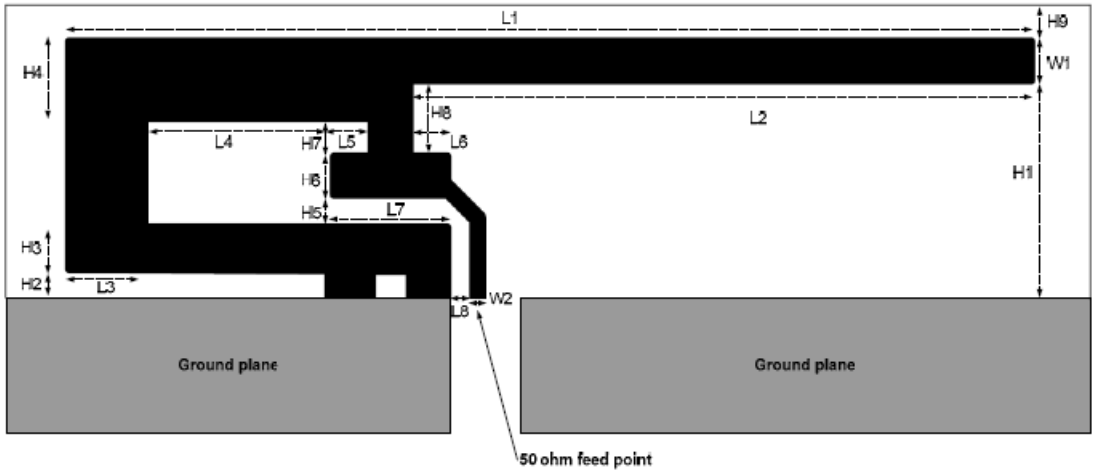


Figure 6-1

H1	5. 9mm	H8	1. 8mm	L6	1mm
H2	0. 9mm	H9	1. 2mm	L7	3. 2mm
H3	1. 3mm	L1	23. 2mm	L8	0. 45mm
H4	2. 2mm	L2	14mm	W1	1. 2mm
H5	0. 65mm	L3	3. 6mm	W2	0. 45mm
H6	1. 2mm	L4	3. 37mm		
H7	0. 8mm	L5	1mm		

Figure 6-2

Electrical Specifications of the Antenna

Antenna S11 Parameter See Figure 7-1 7-2

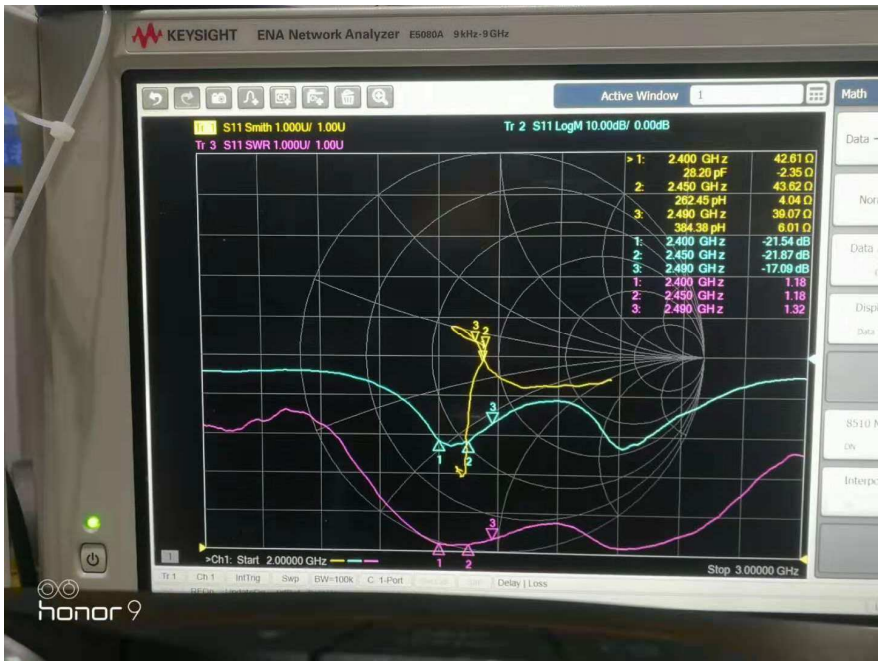


Figure 7-1

Gain and efficiency

Frequence/MHz	2402	2441	2480						
Gain/dBi	-0.114	0.4898	3.01						
Efficiency/%	44.25%	45.92%	58.16%						

Figure 7-2

RF Antenna Layout Parameters

Type of Guidance	Requirement
Trace impedance	50-Ohms ± 10% single-ended
Total route length	<100-mm
Ground between signals	> 3 x line width of ground trace between, stitched VIA to ground
Spacing to other signals	< 3:1

- Signals should be routed along similar route path, but separated by ground trace.
- Trace impedances should match the table, either as microstrip or stripline.
- Total length for both signals should match the table.
- Spacing to ground or other signals on outside of bundled signals should match the table.