Hardware Design

SIM3XXDZ_AN_03_V1.01

Document Title:	Handset Design
Version:	1.01
Date:	2008-03-17
Status:	Release
Document Control ID:	SIM3XXDZ_AN_03_V1.01

General Notes

SIMCom offers this information as a service to its customers, to support application and engineering efforts that use the products designed by SIMCom. The information provided is based upon requirements specifically provided to SIMCom by the customers. SIMCom has not undertaken any independent search for additional relevant information, including any information that may be in the customer's possession. Furthermore, system validation of this product designed by SIMCom within a larger electronic system remains the responsibility of the customer or the customer's system integrator. All specifications supplied herein are subject to change.

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Version history

Date	Version	Description of change	
2006-10-10	01.00	Origin	
2008-03-17	01.01	Add the RF Design Guide Modify the Related documents list Add the ramp-soak-spike reflow profile Modify the serial interface and debug interface Design Guide	

1 Introduction

This document describes the design reference of the SIMCOM SIM3XXDZ module that used to design for handset, include the dual-mode mobile phone, PDA, and the others. The document mainly is about design notes, reference circuit and PCB layout reference.

Table 1: Related documents

SN	Document name	Remark
[1]	*SIM3XXDZ_HD*	*SIM3XXDZ_HD*
[2]	Flash Update Tool_UGD_V1.16	
[3]		
[4]		

This document is intended for the following versions of the SIMCom modules
•SIM300DZ: GSM 900 MHz, DCS 1800 MHz and PCS1900 MHz.Version
•SIM340DZ: GSM/GPRS 900/1800 MHz and 850/1900MHz Version

2 Product concept

Designed for global market, SIM300DZ is tri-band GSM/GPRS engine that works on frequencies, GSM 900 MHz, DCS 1800 MHz and PCS1900 MHz. SIM300DZ is Quad-band GSM/GPRS engine that works on frequencies, GSM/GPRS 900/1800 MHz and 850/1900MHz. .SIM3XXDZ series provides GPRS multi-slot class 10 /Class 8 ① capability and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

① SIM3XXDZ also provides GPRS multi-slot class 8, and the default is class 10.

With a tiny configuration of 33mm x 33mm x 3 mm, SIM3XXDZ can fit almost all the space requirement in your applications, such as Smart phone, PDA phone，Car Phone ，Wireless PSTN ，and other mobile device.

The hardware package is a 48 Pins LCC package:

- 9*GND Pins and 2*VBAT Pins
- 1 Pin is programmable as General Purpose I/O .This gives you the flexibility to develop customized applications.
- Two audio channels include two microphones inputs and two speaker outputs. This can be easily configured by AT command.

With the charge circuit integrated inside the SIM300DZ, it is very suitable for the battery power application.

SIM3XXDZ provides RF antenna interface. And customer's antenna should be located in the custom's main board and connect to module's antenna pad through micro strip line or other type RF trace but the impedance must be controlled in 50Ω.

The SIM3XXDZ is designed with power saving technique, the current consumption to as low as 3mA in SLEEP mode (paging rate 5).

The SIM3XXDZ is integrated with the TCP/IP protocol; extended TCP/IP AT commands are developed for customers to use the TCP/IP protocol easily, which is very useful for those data transfer applications.

3 About Noise

Please pay attention to placement and PCB layout about the SIM3XXDZ design.
1. The Pin assignment of the SIM3XXDZ module is showed as the following figure. The placement of module should be carefully considered to make the Antenna pad as close to Antenna as possible to reduce overall trace lengths and associated long lines can cause. In addition, please keep the RF part and the antenna as far from the system crystal and audio part on main board as possible to reduce possibility of supply pushing of system clock due to transmit bursts from power amplifier.

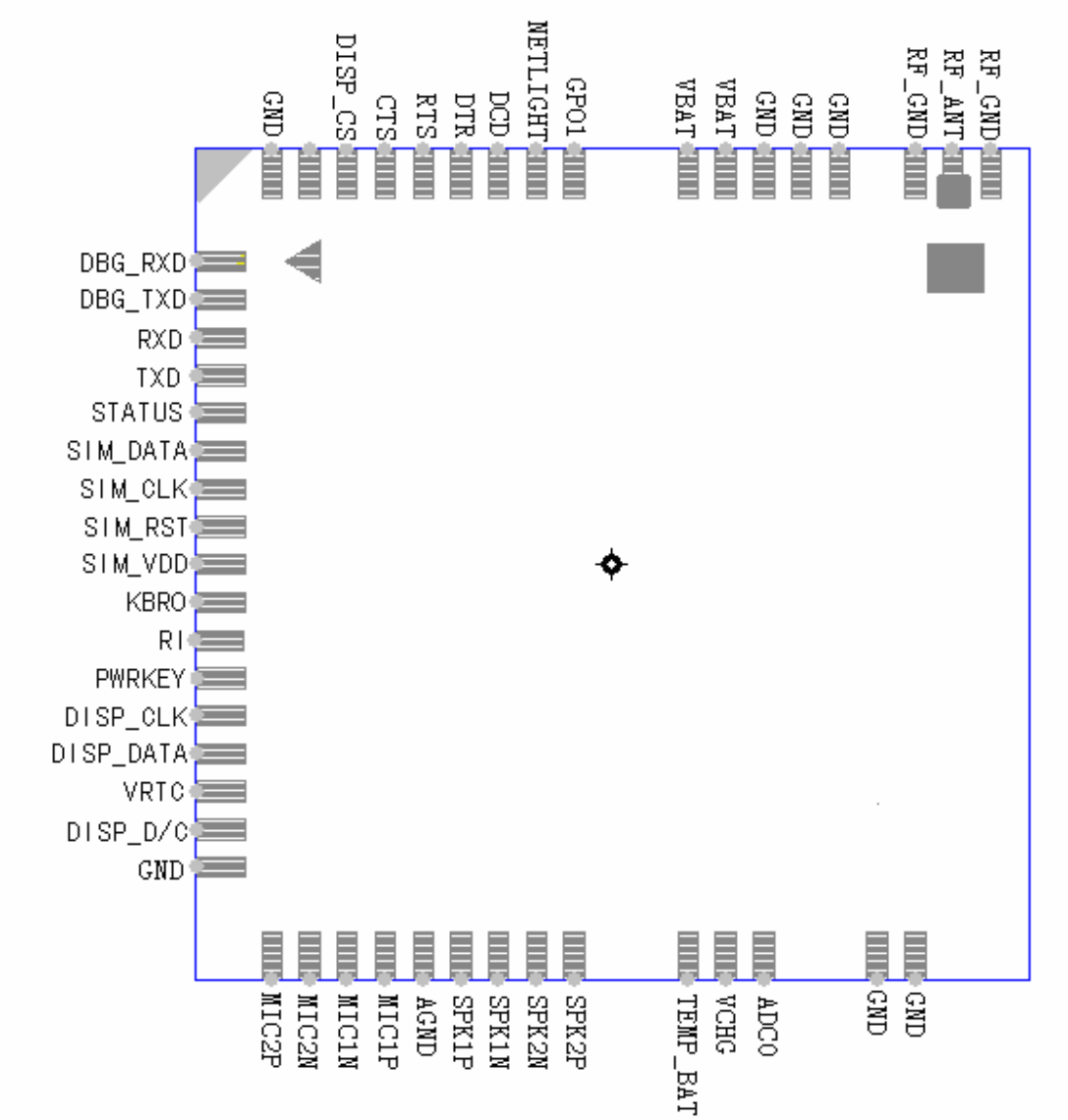


Figure 1: Pin assignment

2. The analog part components should be placed keeping away from digital part. The audio components such as microphone should be placed close to audio interface of module.

There is a recommendation of placement as following figure showed, it can be viewed as generally applicable in handset application.

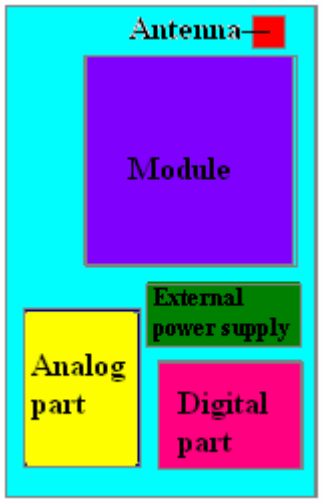


Figure 2: recommendation of placement

3. The digital GND and analog GND can be connected by single point in some main board designs of the handset. This can reduce the RF noise in the audio signal. Showed in the following figure, the green part is analog GND, the yellow part is digital GND. The white flag is the single point connection between the digital GND and the analog GND by copper plane inside the module. The external application circuit can only easily connect to the GND and AGND pads accordingly.

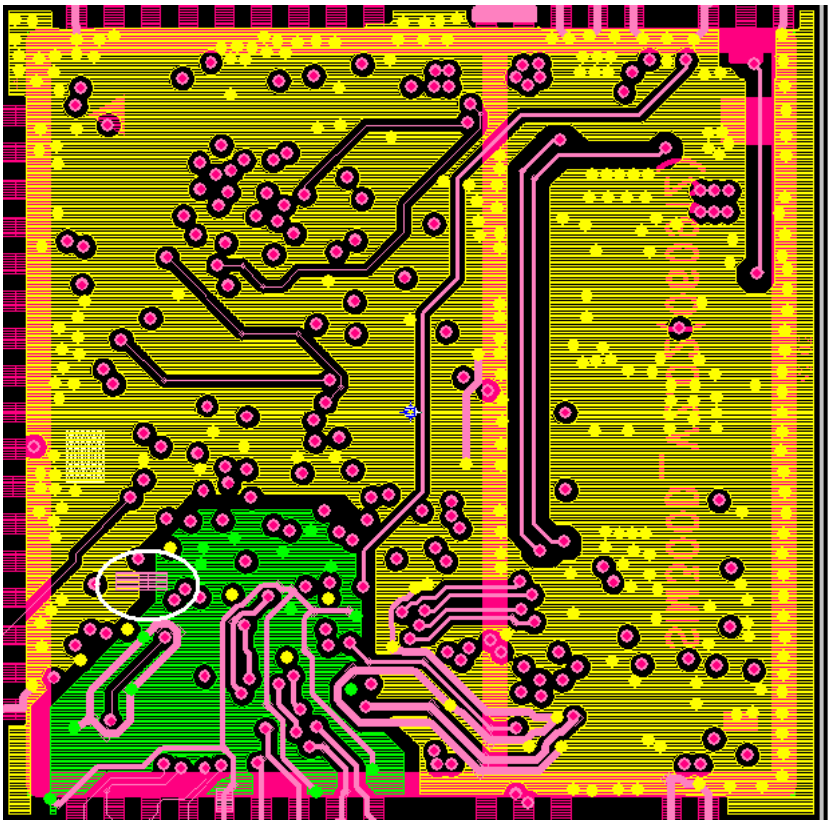


Figure 3: Layout about analogy GND and digital GND

4 About power consumption

If the configuration of peripheral interface circuit is not match the voltage of module internal interface, the power consumption of the system may be increased, some can cause the module very hot.

- All digital I/O comply with 3Volts COMS inside the module. If the user's I/O using higher voltage logics, a resistor bridge or a level shifter may be used to avoid increasing power consumption of the system.
- For directly connection between I/Os , it need to notice the default configuration of the input or output state. If the configuration of I/O not matching , may cause the power consumption increase, even can cause the module very hot. For example, the user's IO is set low level and the module is high level. Showed in the following figure.

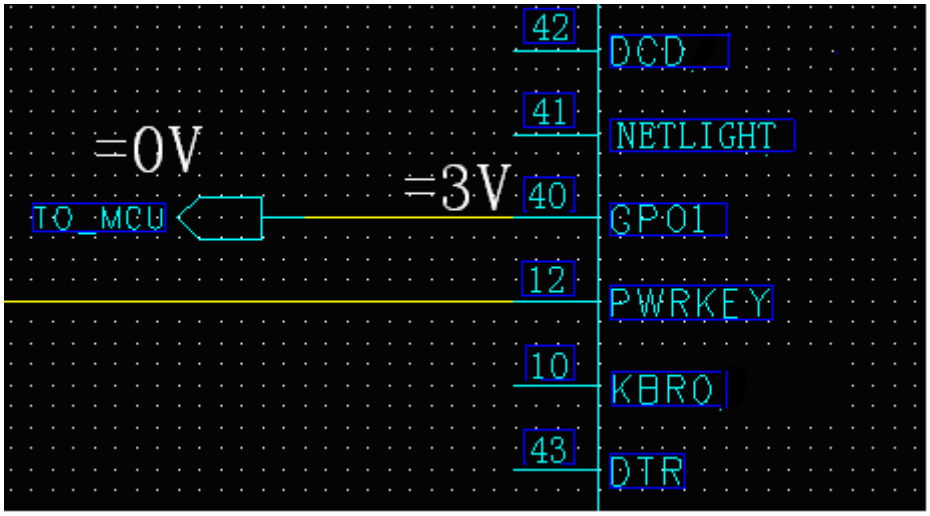


Figure 4: Interface level of the GPIO

5 About status indication

If the user has some requirements about the module's status indication, such as indicating power on or indicating power down. It's recommended that the **STATUS Pin** to user. When software start-up procedure completed, STATUS Pin will drive to 2.8V and keep this level to indicate the module is ready to operate .This Pin can be set by AT command and custom-built software.

6 About serial interface and debug interface

The TXD、RXD、DBG_TXD、DBG_RXD、GND 、PWRKEY must be connected to external interface connector, when SIM3XXDZ is used in handset application design. the TXD、RXD 、

PWRKEY should be used for software upgrading and the DBG_TXD、DBG_RXD for software debugging, and acoustic performance adjusting. Please note that The PWRKEY should be pulled low to GND or low level when SIM3XXDZ be upgrading software. The more detail information about upgrading software please refers to document [1] and document [2]

Notes: It's recommended to connect the download interface to the external interface for flexible update the new requiring application.

7 About SIM card

Showed in the following figure, if the 10uF capacitor is used in the SIM_VDD line, the SIM card may not be detected. The 220nF capacitor is recommended.

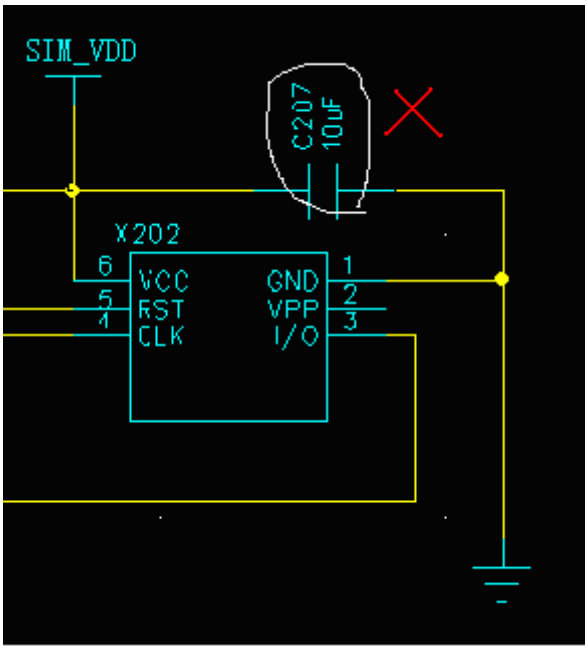


Figure 5: Circuit of the SIM card

8 About Sleep Mode

The DTR Pin of the module is provided to exit the Sleep Mode. If the user want to exit sleep mode quickly. We recommend the KBR0 Pin to control the Sleep Mode. Normally, the module enters into Sleep Mode when the KBR0 Pin is externally pulled to a high level and exit when it is pulled to a low level.

9 About audio trace

We recommend that the audio trace should be put in the middle layer when routing the handset board. We recommend that the audio trace is shielded with GND, and the better method is both the upper layer and lower layer are ground layers. In addition, it is recommended to add more vias with GND net for reducing the RF noise.

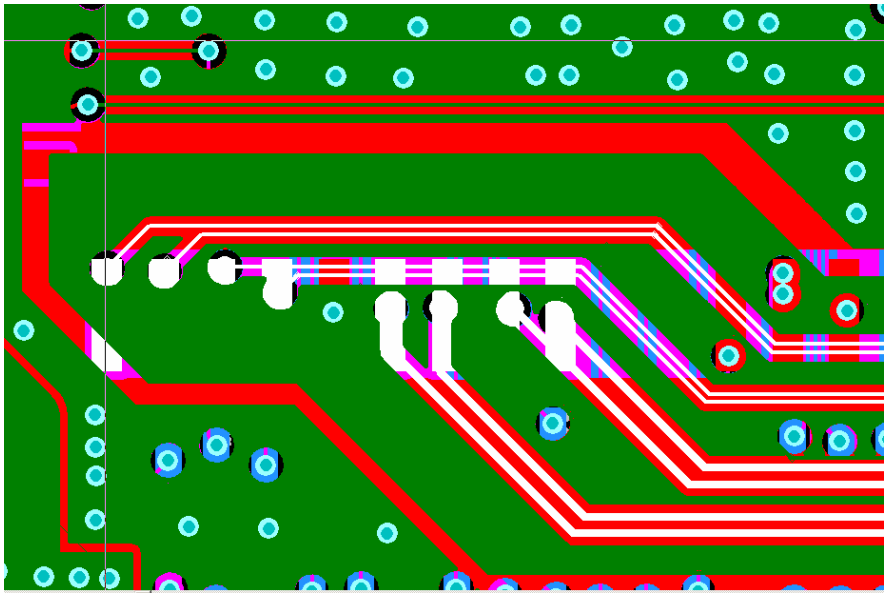


Figure 6: Audio trace routing

11 About RF Design Guide

11.1 The Suggested Impedance Matching Circuit

Because the SIM3XXDZ Module is a SMT type GSM/GPRS wireless communication module, and the antenna must be installed on the customer's PCB board, so an impedance matching circuit must be necessary. The following figure is the suggested impedance matching circuit.

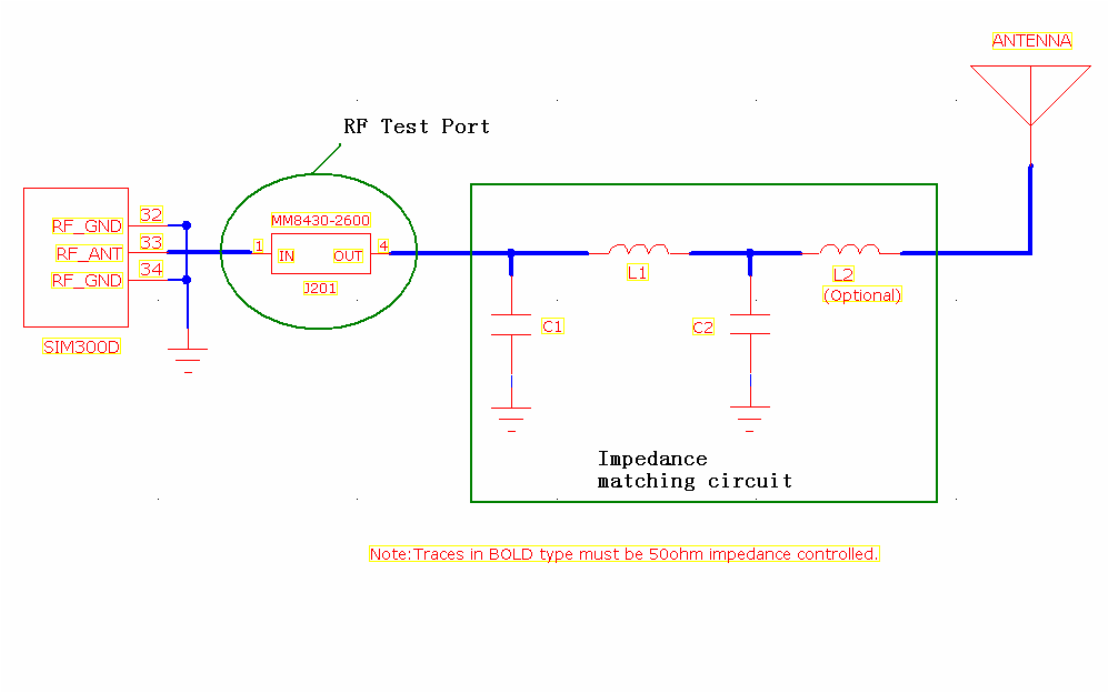


Figure 7: Recommended matching circuit

In the Figure 7, the components L1, C1 and C2 are the components of a pi-type impedance matching circuit. If add the optional component L2, then a T-type matching circuit will be made with the other two components L1 and C2.

In the Figure 7, the traces in Bold type must be 50 ohm impedance controlled when laying out a design.

11.2 PCB Layout Consideration

About the PCB Layout, there are some rules and items must be considered.

1. The RF traces' width must be controlled so that the impedance was maintained at 50ohm with a tolerance about +/-10 percent. (The yellow color traces in the following figure.)
2. The clearance between the RF traces and the ground copper must be twice as the traces' width.
3. The second layer's ground copper under the RF_ANT PAD must be cut off to reduce the parasitic capacitance.
4. In all layers, the ground copper around the ANT PAD must be cut off.

The following figures will be as an illustration for the PCB Layout.

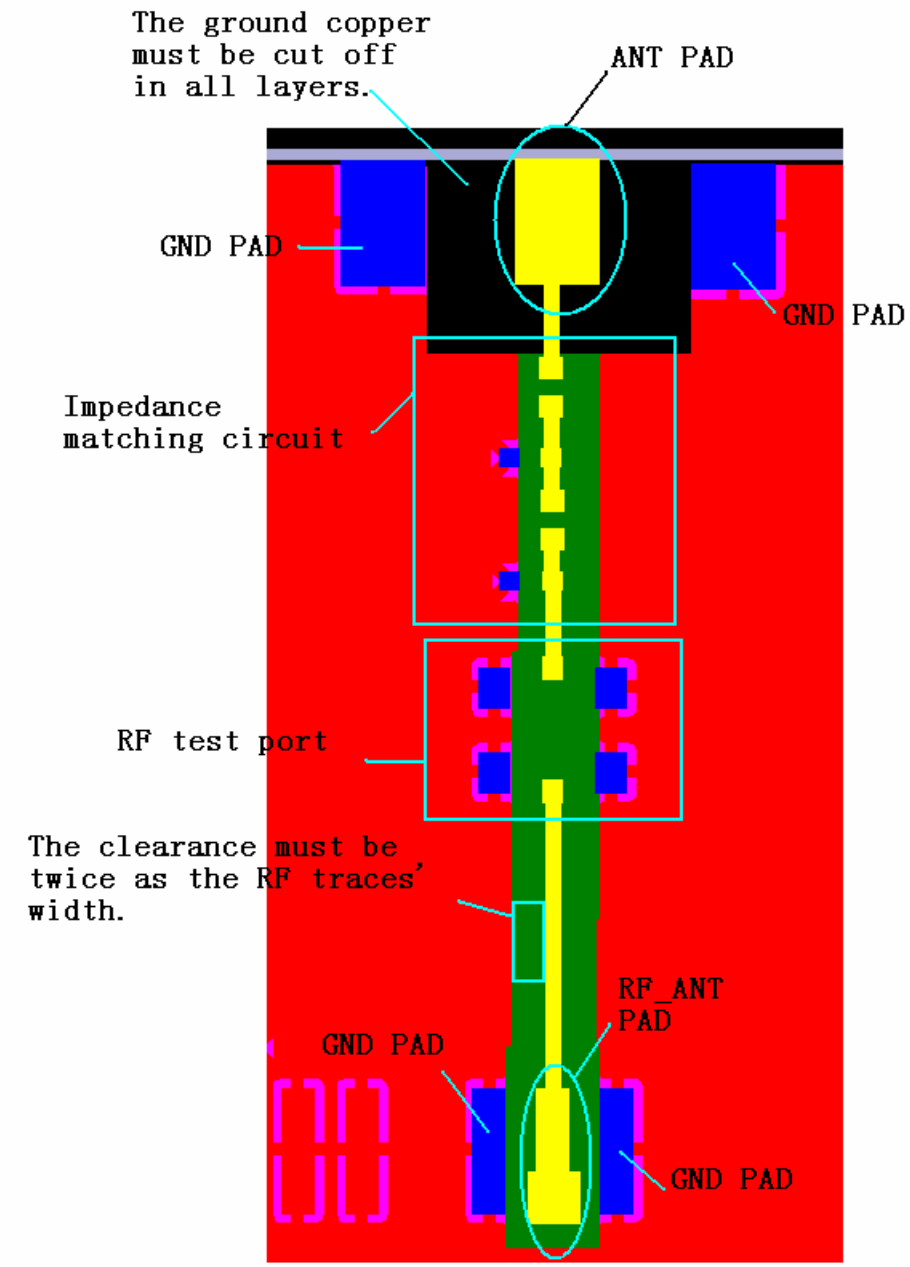


Figure 8: The PCB Layout on Top Layer

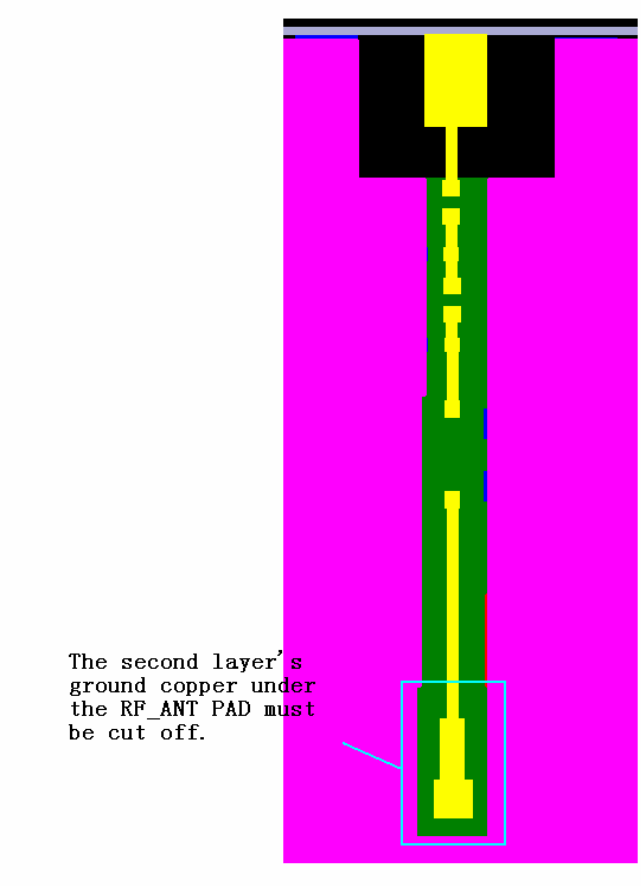


Figure 9: The PCB Layout on the second layer.

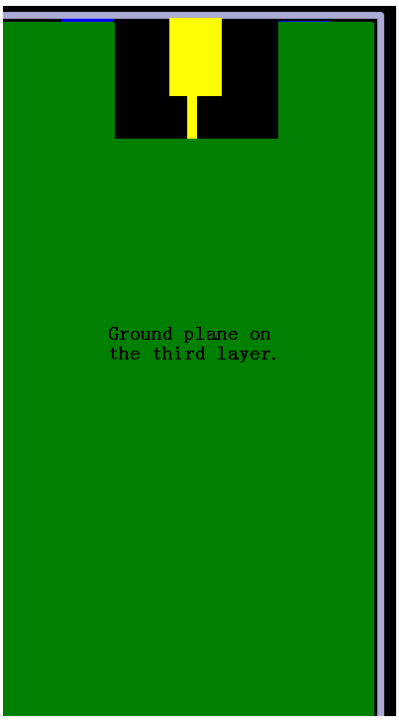
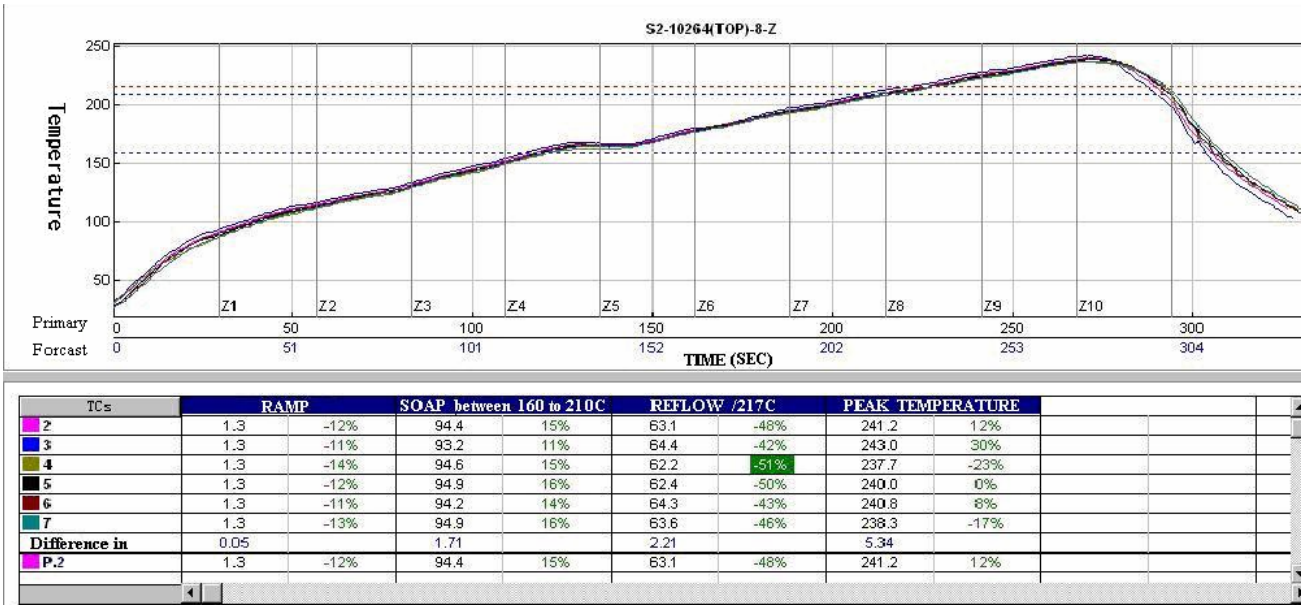


Figure 10: The ground plane on the third layer.

12 The Ramp-soak-spike reflow profile



TCs	RAMP		SOAP between 160 to 210C		REFLOW /217C		PEAK TEMPERATURE	
2	1.3	-12%	94.4	15%	63.1	-48%	241.2	12%
3	1.3	-11%	93.2	11%	64.4	-42%	243.0	30%
4	1.3	-14%	94.6	15%	62.2	-51%	237.7	-23%
5	1.3	-12%	94.9	16%	62.4	-50%	240.0	0%
6	1.3	-11%	94.2	14%	64.3	-43%	240.8	8%
7	1.3	-13%	94.9	16%	63.6	-46%	238.3	-17%
Difference in	0.05		1.71		2.21		5.34	
P.2	1.3	-12%	94.4	15%	63.1	-48%	241.2	12%

Figure 11: The ramp-soak-spike reflow profile

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