OM-O2S / OM-O2SP

Onion Omega2S IoT compute modules

Omega2S Hardware Design Guide (Version 1.0)
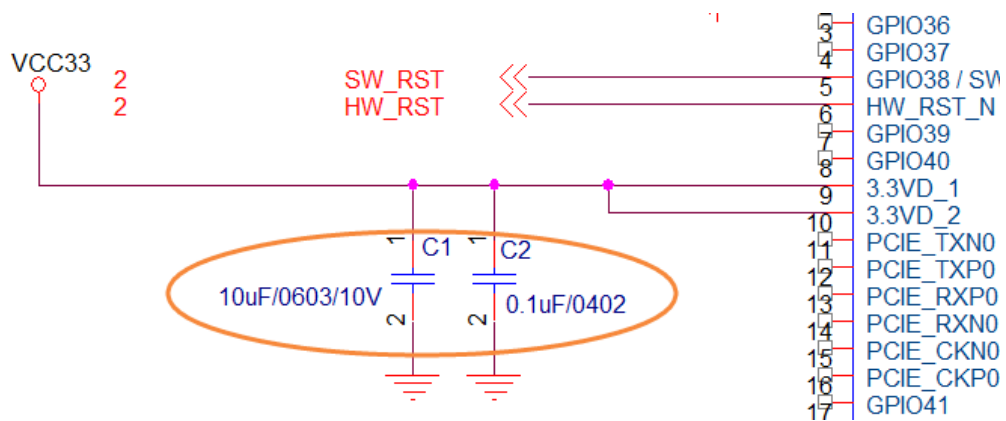
Table of Contents

1. Schematic design guide

1.1 3.3V Power supply

Omega2S has two place need the 3.3V power supply, one is PIN8 and PIN9 3.3VD，another is PIN32 VDD_FLASH.

For the 3.3VD power supply pin, we need to add a 10uf and 0.1uf decoupling capacitor，they should be as close the 3.3VD power supply pin as possible.


1.2 Pins affect system boot

The pins marked red can affect system boot. They must be floating and cannot be Pulled Up or Pulled Down to ensure the system boots properly.

33	SPI_CS1 / GPIO6	O	SPI Chip Select 1 / General Purpose I/O
34	SPI_CLK	O	SPI Clock
35	SPI_MISO	I	SPI Master Input/Slave Output
36	SPI_MOSI	O	SPI Master Output/Slave Input
37	SPI_CS0	O	SPI Chip Select 0
38	GPIO_11	I/O	General Purpose I/O
39	GPIO_12 / UART_TXD0	I/O	General Purpose I/O / Serial UART0 Lite TXD

1.3 Pull-up resistors for I2C

If the product needs to use the I2C interface, there should be added a pull-up resistor for I2C,and the resistor value can be 4.7K.
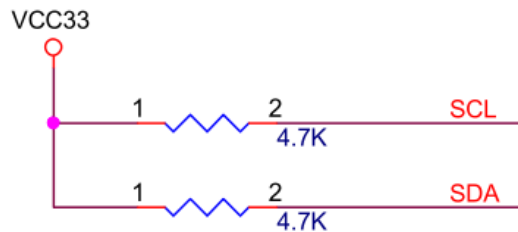
If the product needs to use Omega2S's I2C to ctrl a 5V-power device , there should be added a level switch circuit of the i2c line,the reference circuit can be as below:
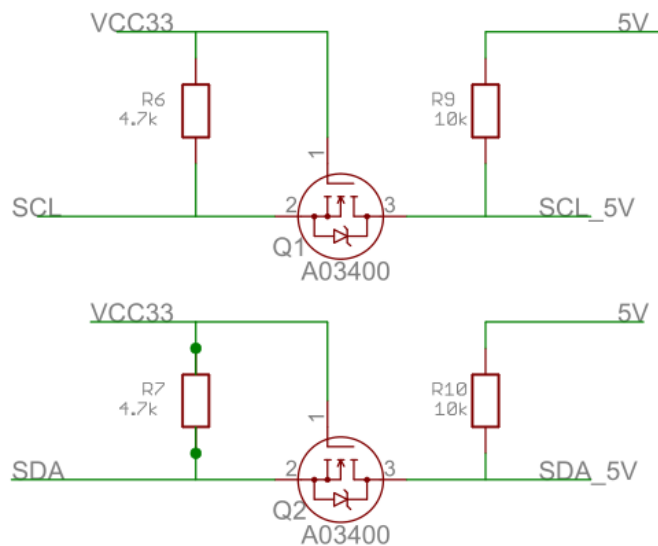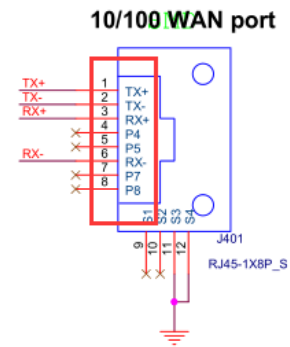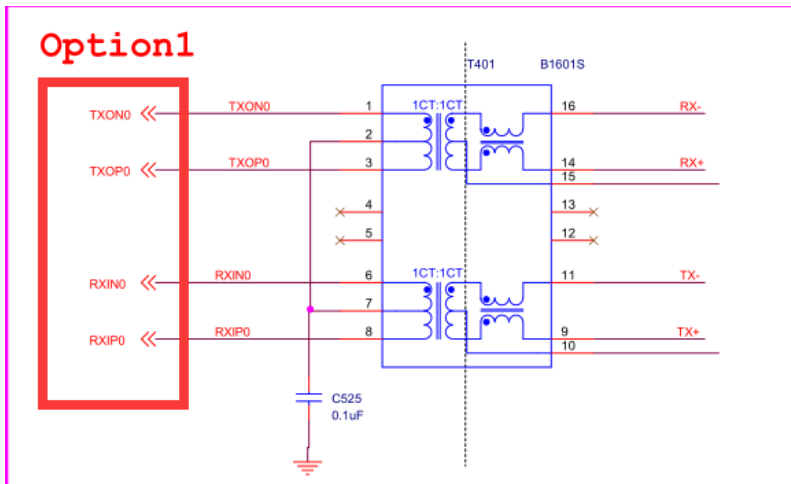

1.4 Ethernet port

There are two Ethernet circuit options,one is using the Network transformer ,another is capacitive coupling mode,but regardless of which mode is selected, please make sure the final connection as below:

Omega2S RXOP0   -> RJ45 Port PIN 1 TX+

Omega2S RXON0   -> RJ45 Port PIN 2 TX-

Omega2S TXOP0   -> RJ45 Port PIN 3 RX+

Omega2S TXON0   -> RJ45 Port PIN 6 RX-

1.5 Two antenna design

Having a single PCB layout to serve two antenna use cases is definitely possible.

Use Case 1) Use onboard U.FL connector to connect external antenna.

Use Case 2) Connect a chip antenna (or other conenctor) to Pin 24 (WIFI_RF).

To serve both use cases with a single design, a 0 ohm resistor connected to Pin 24 (WIFI_RF) will do the trick:

Use Case 1) Use Omega2S onboard u.FL connector, leave 0R resistor unpopulated.

Use Case 2) Populate 0R, connect chip antenna or other connector to pin 24 (WIFI_RF).
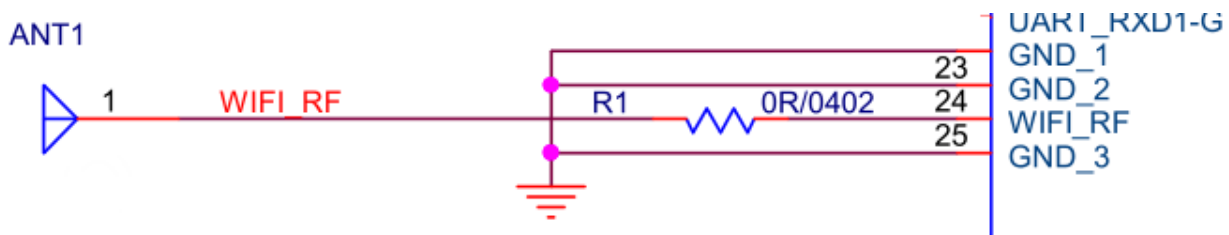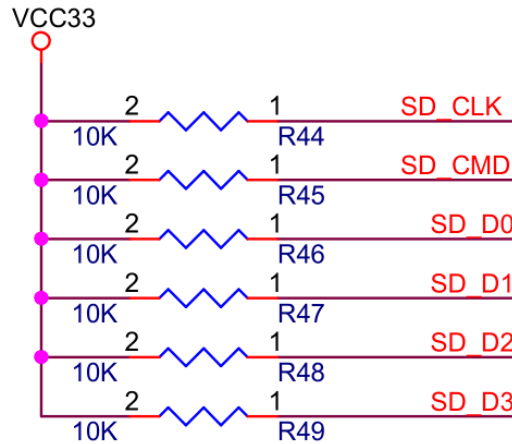

Note 1: only one of pin 24 or the u.FL connector should be active in a design. If both pin 24 and the u.FL connector are connected to antennae, the transmission power will be split between the two.

Note 2: With this design, the U.FL connector can be detuned by the pin 24 to 0R trace. The longer the trace connected to pin 24, the more it will affect the u.fl tuning. We recommend putting the 0R as close as possible to pin 24. To guarantee no U.FL detuning in your design, fall back to a single-antenna use-case design.

1.6 Extended storage

Omega2S has the SDIO interface ,it can support the Micro SD Card,SD NAND Flash and eMMC as an extended storage.

Each SDIO PINs should be added a pull-up resistor,and the resistor value can be 10K.

VCC33

	2		1	SD_CLK
	10K		R44	
	2		1	SD_CMD
	10K		R45	
	2		1	SD_D0
	10K		R46	
	2		1	SD_D1
	10K		R47	
	2		1	SD_D2
	10K		R48	
	2		1	SD_D3
	10K		R49	

1.6.1 About Micro SD card

There is a detect pin(SD_CD) to check whether the Card state is push-in or pull-out,

Omega2S default active-level is low voltage, it means that Micro SD card is push-in.

This pin should be added a pull-up resistor,and the resistor value can be 10K.
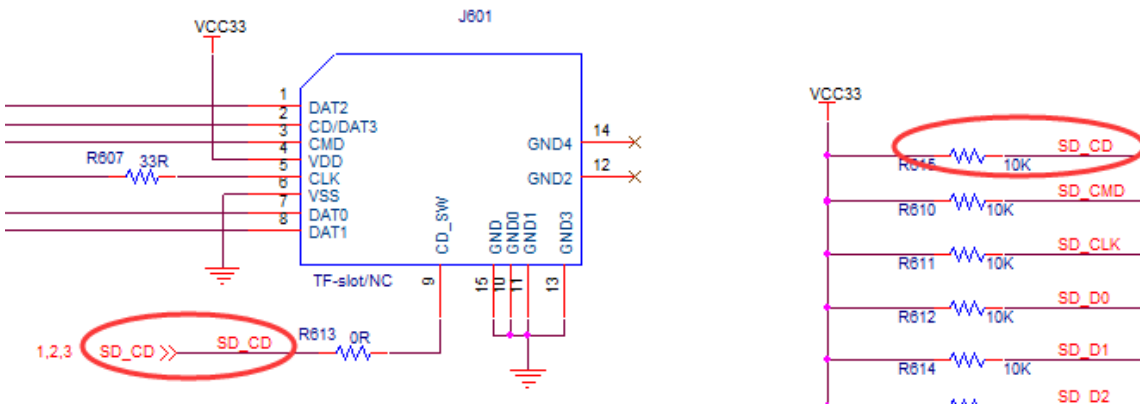
1.6.2 About eMMC

When selecting an eMMC chip, Omega2S has success with chips that have the following:

e.MMC 5.1 Interface ,FBGA153 Packaging ,11.5mm x 13mm Dimensions

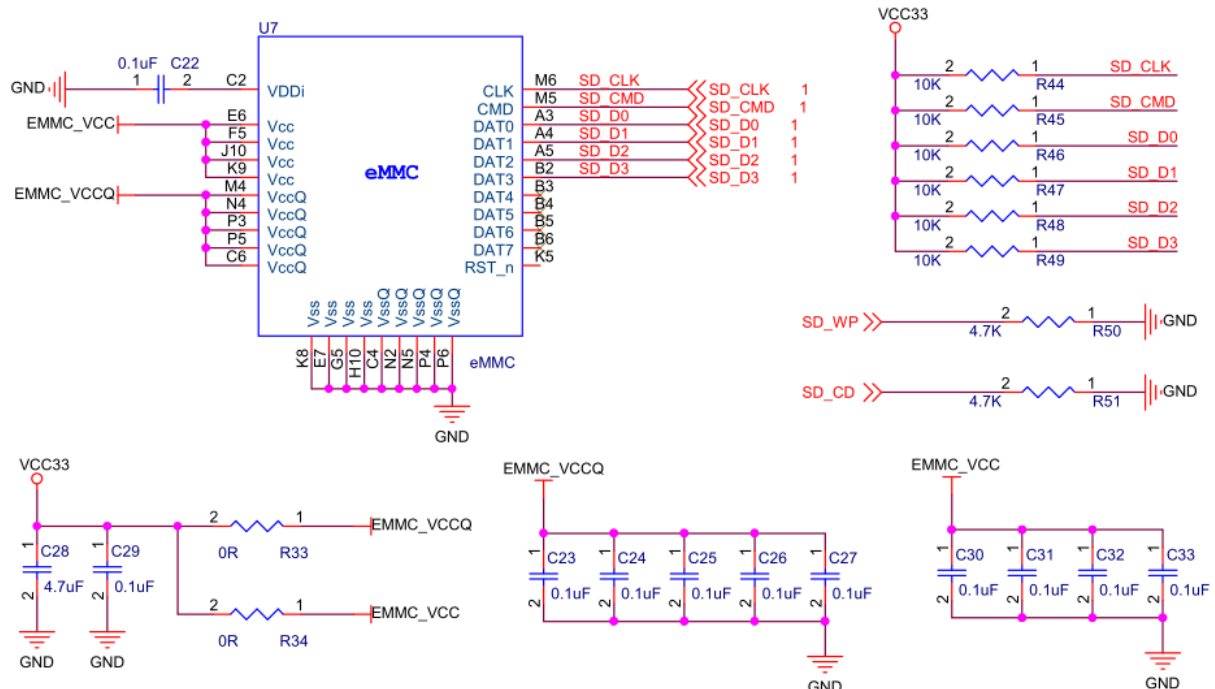Omega2S has successfully tested with the following chips:

Brand	Part No	Remark
Sandisk	SDINBDG4-8G	8GB
Kinston	EMMC08G-T227-A01	8GB
Samsung	KLMBG1WEPD-B031	8GB
Toshiba	THGBMBG6D1KBAIL	8GB

Circuit design

The detect pin(SD_CD) should be connected to a pull-down resistor.

It's not absolutely necessary to connect GPIO18-21 to the eMMC, please try out disconnecting these GPIOs from the eMMC.
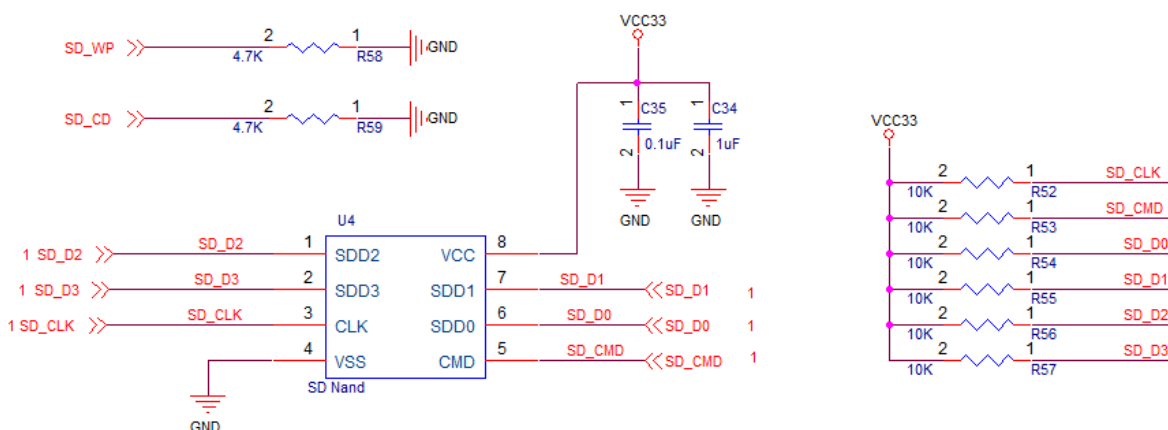
Reference design:

1.6.3 About SD Nand Flash

SD Nand Flash is embedded storage based on NAND Flash and SD controller,it is LGA-8 package(WSON), the size is 8mm x 6mm x0.75mm.

We've successfully tested with the following chips：

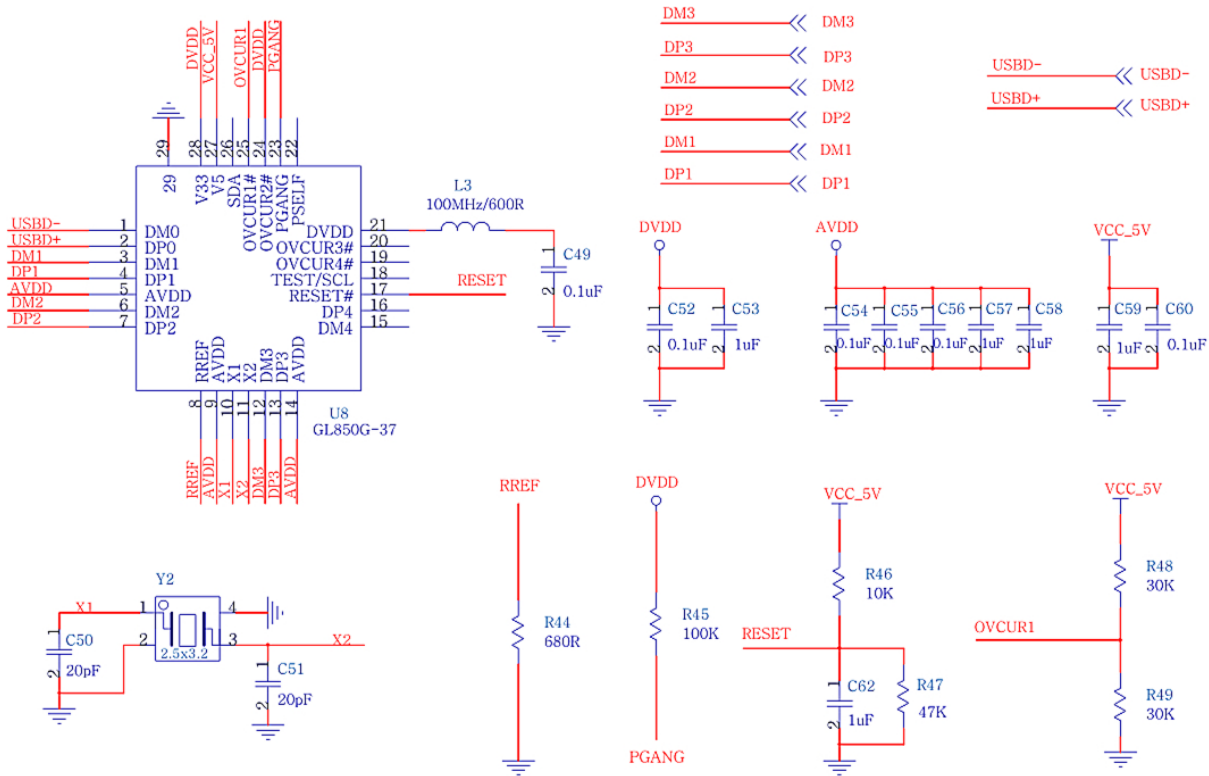| Brand	Part No	Remark
Longsto	CSNP1GCR01-AMW	1Gbit(128MB)
Longsto	CSNP4GCR01-AMW	4Gbit(512MB)

Reference design:

1.7   USB hub

Omega2S has just one USB interface, it can be used a usb hub to extend more usb ports. Omega2S has successfully tested with usb hub:**GL850G-OHY37** (QFN28 package).

Reference design:

1.8   Test points

If the product don't need the SW_RST、Uart0、Ethernet port, it is recommended to reserve test points of each PINs，so it can be easied for factory testing or upgrading firmware of Omega2S .
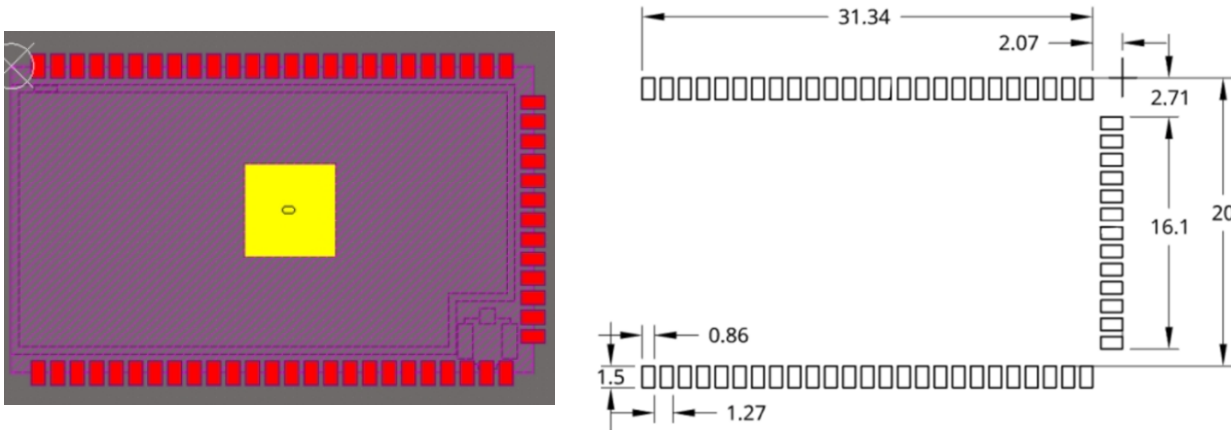
Note : when the product needs to pass the FCC/CE certification, it also need to use these PINs.
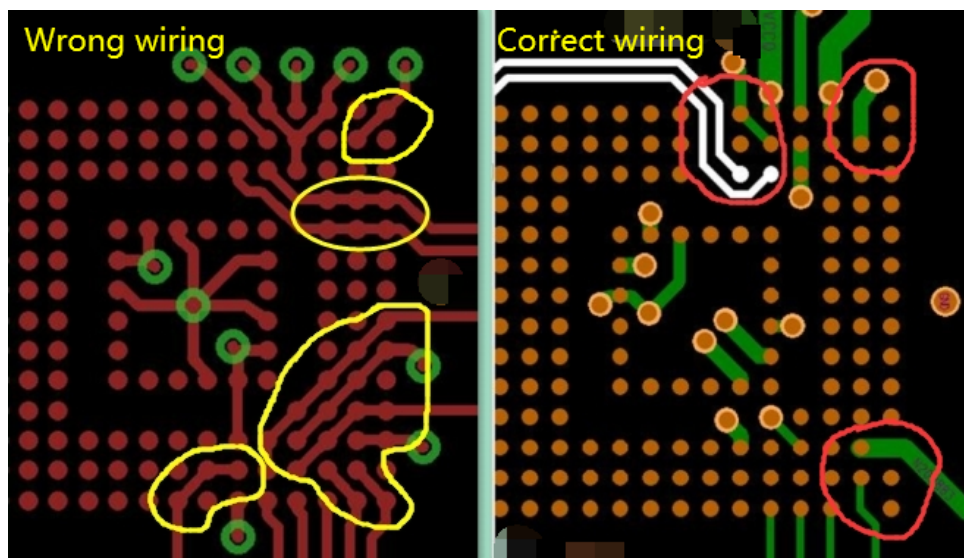
2. PCB layout design guide

2.1 Package of Omega2S

The middle pad of Omega2S should be non-welding.

2.2 Package of eMMC

As the eMMC BGA package has 153 balls,when wiring the pcb line,the circuit line should not connect to the unuse BGA Pads, we should remove the unnecessary balls on the way that the circuit line should pass.
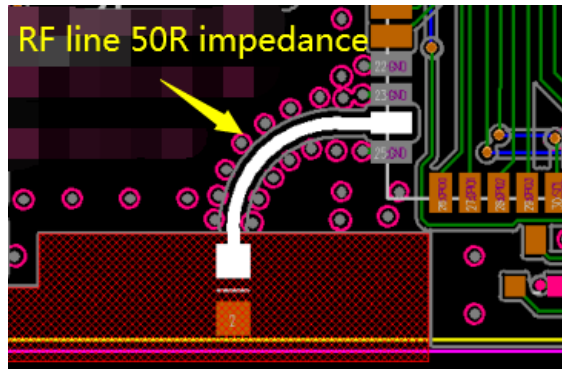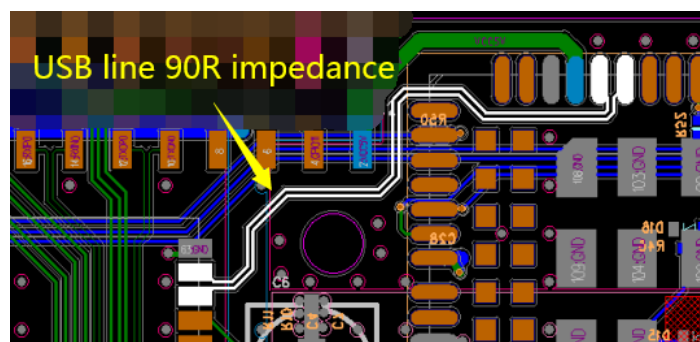

2.3 Impedance of the PCB line

For better performance, it is recommended to set an impedance of following lines.

RF pcb line: it is recommended to set a 50R impedance.

Note: around the RF pcb line should be added more gnd vias.

USB line: it is differential signal , it is recommended to set a 90R impedance.

2.4   Test points

If the PCB board has enough space,the test points can be a 2.0mm or 2.54mm pitch PCB via.