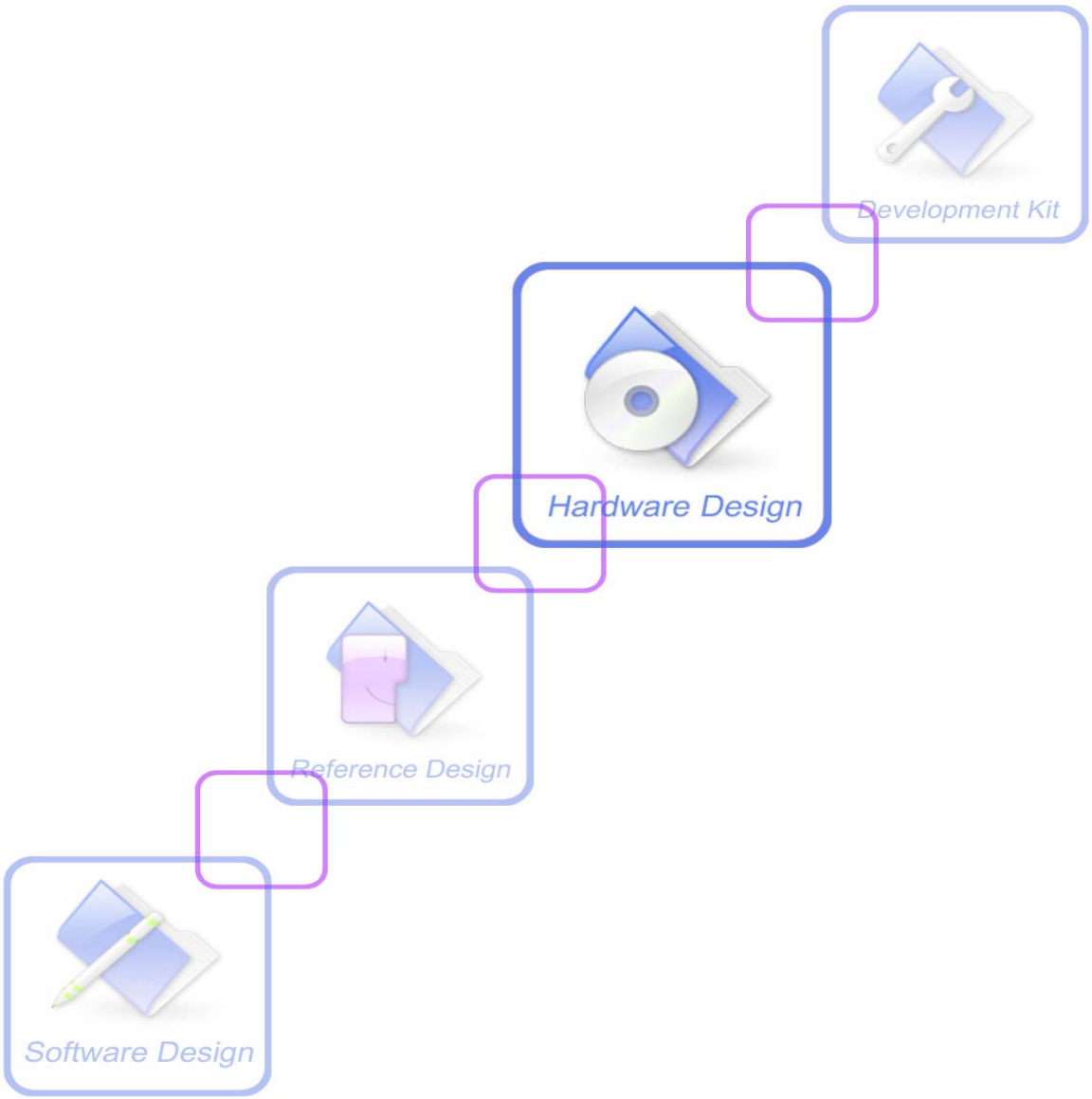
SIM5350_ Hardware_Design _V1.02



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Version History

Date	Version	Description of change	Author
2013-08-15	1.00	Origin	Yang Hongliang Wang Yang
2013-10-15	1.01	The “Need external 47K pull-up resistor to VDD_1V8” comment of the “UART_DTR” row in table 5 was deleted.	Yang Hongliang
2014-03-27	1.02	Delete the description of SIM5350X-J and SIM5350X-A.	Yang Hongliang Zhang Bo

1. Introduction

This document describes SIM5350 hardware interface in great details, which can help user to quickly understand SIM5350 interface specifications, electrical and mechanical details.

2. SIM5350 Overview

SIM5350 series support quad-band GSM/GPRS/EDGE and dual-band UMTS/HSDPA/HSUPA/HSPA+, which work on frequencies GSM850, EGSM900, DCS1800, PCS1900, WCDMA2100/900 and 2100/850 or 1900/850. The modules can be chosen based on the wireless network configuration. In this document, the entire radio band configuration of SIM5350 series is described in the following table.

Table 1: SIM5350 Series Frequency Bands

Standard	Frequency	SIM5350X-E(1)
GSM	GSM 850MHz	✓
	EGSM 900MHz	✓
	DCS1800MHz	✓
	PCS1900MHz	✓
WCDMA	WCDMA 850MHz	
	WCDMA 900MHz	✓
	WCDMA 1900MHz	
	WCDMA 2100MHz	✓
HSPA+	HSDPA	✓
	HSUPA	✓
	Dual -Cell HSPA+	✓ （**SIM5350H-E**）
DRX	Receiver Diversity	✓

(1) SIM5350X-E: Letter 'X' means 'H','M' or' L'. H version supports DC-HSPA+, download speed is up to 42Mbps; M version supports HSPA+, download speed is up to 21Mbps; L version supports HSPA, download speed is up to 14.4Mbps.

With a tiny configuration of 20*30*2.4mm, SIM5350 can meet almost all the space requirements in user applications, such as smart phone, PDA and other mobile devices. SIM5350 has 96 pin pads of LGA packaging, and provides all hardware interfaces between the module and customers' boards.

- **Power supply: 3.3V+0.3/-0.1V**
- **USB Interface**
- **Serial Interface**
- **SIM Interface**
- **PCM Interface**
- **SDIO Interface**
- **I2C Interface**
- **GPIO**
- **PWM**
- **LDO Power Output**

2.1. SIM5350 Key Features

Table 2: SIM5350 Key Features

Feature	Implementation
Power supply	3.3V+0.3V/-0.1V
Frequency bands	● GSM /GPRS/EDGE Quad-band: GSM850，GSM 900, DCS 1800, PCS 1900 ● UMTS/HSPA+ Dual-Band: WCDMA2100/900，2100/850，1900/850
Transmitting power	GSM/GPRS: ● Class 4 (2W): GSM850, EGSM900 ● Class 1 (1W): DCS1800, PCS1900 EDGE: ● Class E2 (0.5W): GSM850, EGSM900 ● Class E1 (0.4W): DCS1800, PCS1900 UMTS: ● Class 3 (0.25W): WCDMA2100/900, 2100/850, 1900/850
Connectivity Speed	● GPRS Class B, multi-slot class 12 operation, coding scheme: CS1-4, DL maximum speed: 85.6kbps; UL maximum speed: 85.6kbps ● EDGE multi-slot class 12 operation, coding scheme: MSC1-9, DL maximum speed: 236.8kbps; UL maximum speed: 236.8kbps ● UMTS R99 speed: 384 kbps DL/UL ● SIM5350H series: HSDPA Category 24 - 42.2 Mbps + HSUPA Category 7 - 11.5 Mbps ● SIM5350M series: HSDPA Category 14 - 21 Mbps + HSUPA Category 6 - 5.76 Mbps ● SIM5350L series: HSDPA Category 10 - 14.4 Mbps + HSUPA Category 6 - 5.76 Mbps
SMS	● MT, MO, CB, Text and PDU mode ● SMS storage: SIM card
USB	USB 2.0 High speed port ● USB Application Port ● USB Debug Port ● USB Speech Port ● Modem ● Removable disk
UART	UART: ● Full modem interface with status and control lines, unbalanced, asynchronous. ● 1200bps to 115200bps. ● Can be used for AT commands or data stream. ● Support RTS/CTS hardware handshake and software ON/OFF flow control.
SIM interface	Support SIM card: 1.8V, 3V
PCM interface	Support PCM master mode .Data length is 16 bits (linear)，PCM clock rate is 512KHz.
External antenna	Antenna pad, dual Antenna.
Temperature range	● Normal operation temperature: -40℃ ~ +85℃ ● Storage temperature: -45℃ ~ +90℃

Physical characteristics	Size: 20*30*2.4mm Weight: 3g
Firmware upgrade	Firmware upgrade over USB interface

Table 3: Coding schemes and maximum net data rates over air interface

Multislot definition(GRPS/EDGE)			
Slot class	**DL slot number**	**UL slot number**	**Active slot number**
1	1	1	2
2	2	1	3
3	2	2	3
4	3	1	4
5	2	2	4
6	3	2	4
7	3	3	4
8	4	1	5
9	3	2	5
10	4	2	5
11	4	3	5
12	4	4	5
GPRS coding scheme	**Max data rata（4 slots）**		**Modulation mode**
CS 1 = 9.05 kb/s / time slot	36.2 kb/s		GMSK
CS 2 = 13.4 kb/s / time slot	53.6 kb/s		GMSK
CS 3 = 15.6 kb/s / time slot	62.4 kb/s		GMSK
CS 4 = 21.4 kb/s / time slot	85.6 kb/s		GMSK
EDGE coding scheme	**Max data rata（4 slots）**		**Modulation mode**
MCS 1 = 8.8 kb/s/ time slot	35.2 kb/s		GMSK
MCS 2 = 11.2 kb/s/ time slot	44.8 kb/s		GMSK
MCS 3 = 14.8 kb/s/ time slot	59.2 kb/s		GMSK
MCS 4 = 17.6 kb/s/ time slot	70.4 kb/s		GMSK
MCS 5 = 22.4 kb/s/ time slot	89.6 kb/s		8PSK
MCS 6 = 29.6 kb/s/ time slot	118.4 kb/s		8PSK
MCS 7 = 44.8 kb/s/ time slot	179.2 kb/s		8PSK
MCS 8 = 54.4 kb/s/ time slot	217.6 kb/s		8PSK
MCS 9 = 59.2 kb/s/ time slot	236.8 kb/s		8PSK
HSDPA device category	**Max data rate（peak）**		**Modulation mode**
Category 1	1.2Mbps		16QAM,QPSK
Category 2	1.2Mbp		16QAM,QPSK
Category 3	1.8Mbps		16QAM,QPSK
Category 4	1.8Mbps		16QAM,QPSK
Category 5	3.6Mbps		16QAM,QPSK

Category 6	3.6Mbps	16QAM,QPSK
Category 7	7.2Mbps	16QAM,QPSK
Category 8	7.2Mbps	16QAM,QPSK
Category 9	10.2Mbps	16QAM,QPSK
Category 10	14.4Mbps	16QAM,QPSK
Category 11	0.9Mbps	QPSK
Category 12	1.8Mbps	QPSK
Category 13	17.6Mbps	64QAM
Category 14	21.1Mbps	64QAM
Category 15	23.4Mbps	16QAM
Category 16	28Mbps	16QAM
Category 17	23.4Mbps	64QAM
Category 18	28Mbps	64QAM
Category 19	35.5Mbps	64QAM
Category 20	42Mbps	64QAM
Category 21	23.4Mbps	16QAM
Category 22	28Mbps	16QAM
Category 23	35.5Mbps	64QAM
Category 24	42.2Mbps	64QAM
HSUPA device category	**Max data rate（peak）**	**Modulation mode**
Category 1	0.96Mbps	QPSK
Category 2	1.92Mbps	QPSK
Category 3	1.92Mbps	QPSK
Category 4	3.84Mbps	QPSK
Category 5	3.84Mbps	QPSK
Category 6	5.76Mbps	QPSK
Category 7	11.5Mbps	16QAM

2.2. Operating Mode

The table below summarizes the various operating modes of SIM5350.

Table 4: Operating Mode

Mode	Function	
Normal operation	GSM/GPRS/EDGE/WCDMA/HSPA+ SLEEP	Module will automatically go into sleep mode if the conditions of sleep mode are enabled and there is no on air and no hardware interrupt (such as GPIO interrupt or data on serial port). In this case, the current consumption of module will reduce to the minimal level. In sleep mode, the module can still receive paging message and SMS.
	GSM/WCDMA IDLE	Software is active. Module is registered to the GSM/WCDMA network, and the module is ready to communicate.
	GSM/WCDMA TALK	Connection between two subscribers is in progress. In this case, the power consumption depends on network settings such as DTX off/on,

		FR/EFR/HR, hopping sequences, and antenna.
	GPRS/EDGE/HSPA+ STANDBY	Module is ready for GPRS/EDGE/HSPA+ data transfer, but no data is currently sent or received. In this case, power consumption depends on network settings and GPRS/EDGE/HSPA+ configuration.
	GPRS/EDGE/HSPA+ DATA TRANSFER	There is GPRS/EDGE/HSPA+ data transfer in progress. In this case, power consumption is related with network settings (e.g. power control level); uplink/downlink data rates and GPRS configuration (e.g. used multi-slot settings).
Minimum functionality mode	AT command “AT+CFUN” can be used to set the module to a minimum functionality mode without removing the power supply. In this mode, the RF part of the module will not work or the SIM card will not be accessible, or both RF part and SIM card will be closed, and the serial port is still accessible. The power consumption in this mode is lower than normal mode.	

2.3. Functional Diagram

The following figure is SIM5350 functional diagram.

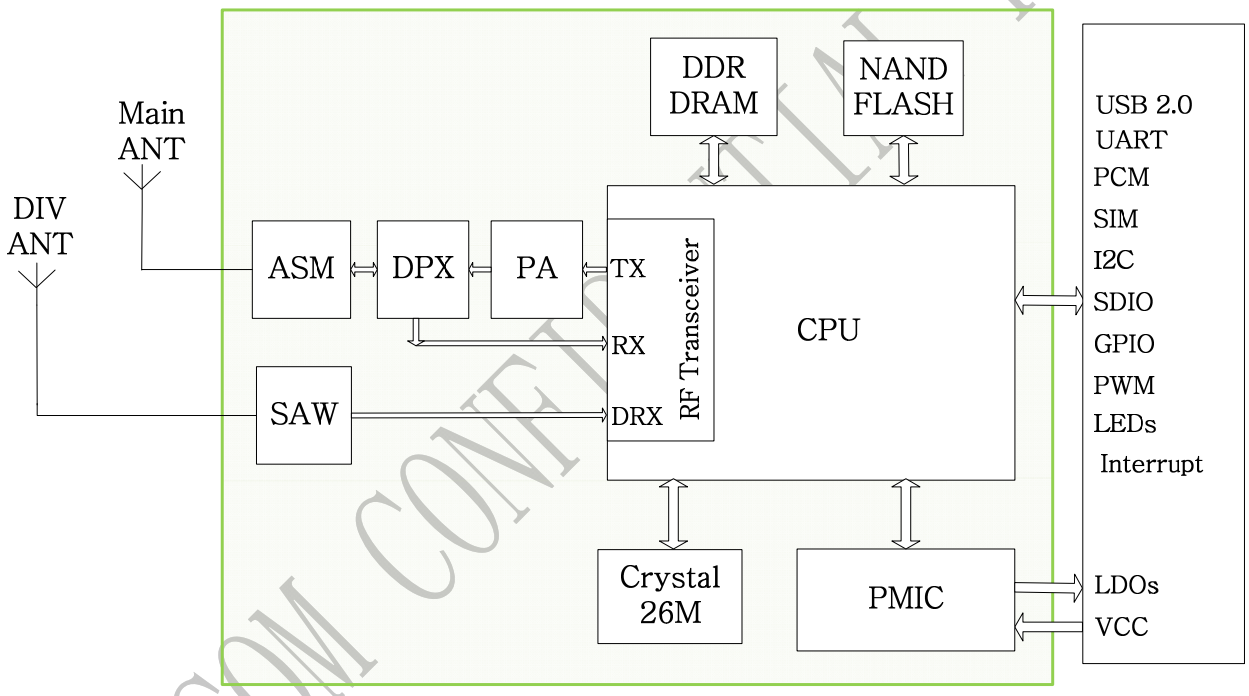

Figure 1: SIM5350 Functional Diagram

3. Package Information

3.1. Pin Out Diagram

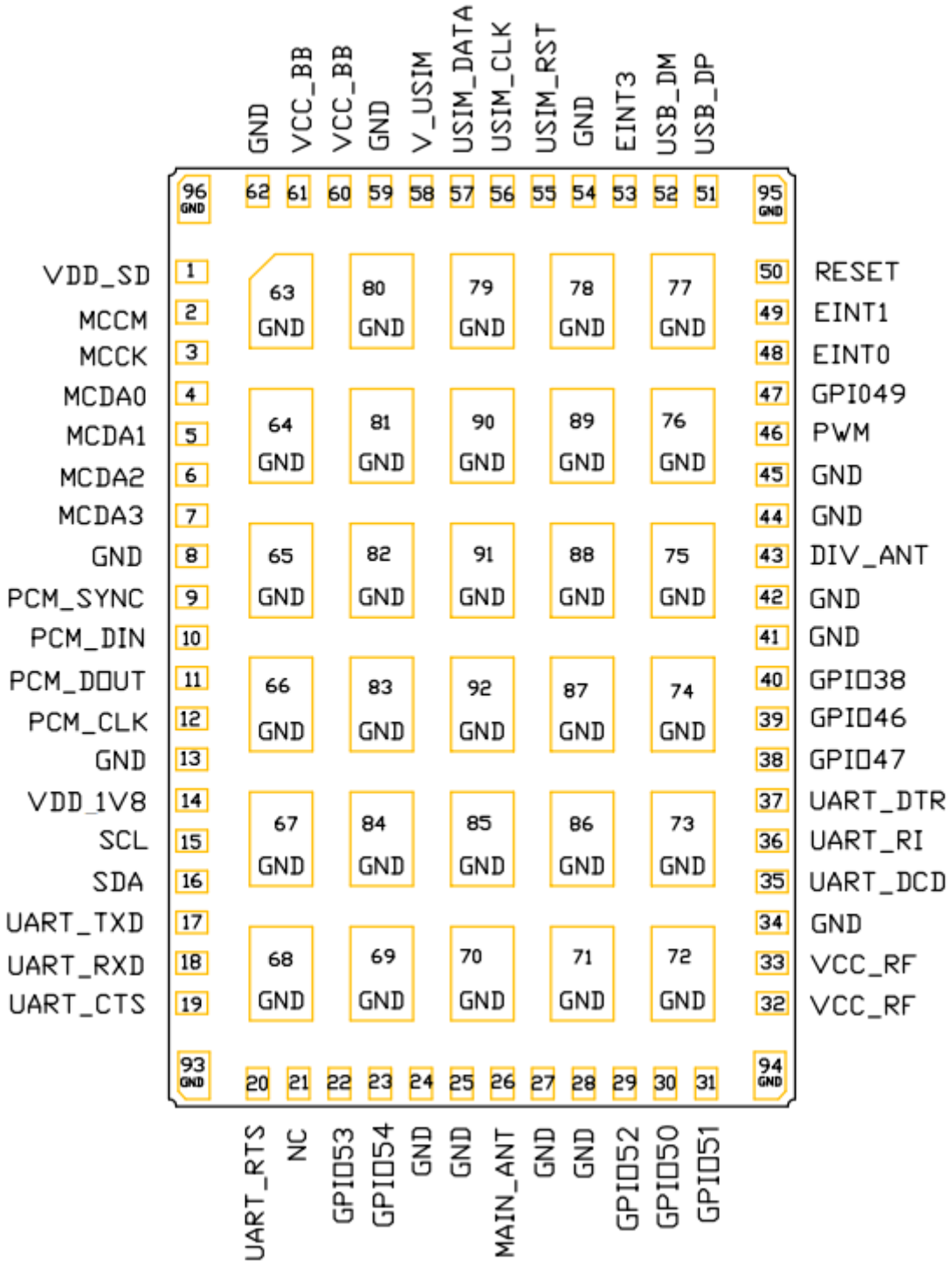

Figure 2: SIM5350 Pin Out Diagram (Top Perspective View)

3.2. Pin Description

Table 5: Pin Description

Pin name	Pin number	I/O	Description	comment
Power supply				
VCC_BB	60, 61	I	3.3V+0.3V/-0.1V Power supply for baseband circuit	
VCC_RF	32, 33	I	3.3V+0.3V/-0.1V Power supply for radio frequency circuit	
VDD_SD	1	O	2.8/3.0/3.1/3.3V Configurable LDO output, default 3.0V output, maximum output current is 100mA	
VDD_1V8	14	O	1.8V LDO output, maximum output current is 30mA	
GND	8, 13, 24, 25, 27, 28, 34, 41, 42, 44, 45, 54, 59, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96		Ground	
Reset				
RESET	50	I	Reset input (Active low)	Built-in pull-up resistor to VDD_1V8
USB 2.0				
USB_DP	51	I/O	USB 2.0 high speed port for data transfer, debug and FW download, etc	
USB_DM	52			
UART				
UART_TXD	17	O	Transmit data	VDD_1V8 domain
UART_RXD	18	I	Receive data	
UART_CTS	19	I	Clear to send	
UART_RTS	20	O	Request to send	
UART_DCD	35	I/O	Data carrier detect	
UART_RI	36	I/O	Ring indicator, wake up host	
UART_DTR	37	I/O	Data terminal ready, wake up SIM5350	

SIM card interface				
V_USIM	58	O	1.8/3.0V Configurable LDO output, default 1.8V output, maximum output current is 30mA	
USIM_DATA	57	I/O	SIM data input/output	
USIM_CLK	56	O	SIM clock	
USIM_RST	55	O	SIM reset	
PCM interface				
PCM_SYNC	9	O	PCM synchrony, Internal 4.7K pull-down for system configure	If these pins are unused, keep open, VDD_1V8 domain
PCM_DIN	10	I	PCM data input,	
PCM_DOUT	11	O	PCM data output, Internal 4.7K pull-down for system configure	
PCM_CLK	12	O	PCM clock	
SDIO interface				
MCCM	2	O	SDIO data/command control	If these pins are unused, keep open, VDD_SD domain.
MCCK	3	O	SDIO clock output	
MCDA0	4	I/O	SDIO data 0	
MCDA1	5	I/O	SDIO data1	
MCDA2	6	I/O	SDIO data2	
MCDA3	7	I/O	SDIO data3	
I2C interface				
SCL	15	O	I2C clock output	Need external pull-up resistor to VDD_1V8.
SDA	16	I/O	I2C data	
GPIO				
GPIO53	22	I/O	Programmable general purpose input and output	If these pins are unused, keep open, VDD_1V8 domain
GPIO54	23	I/O	Programmable general purpose input and output	
GPIO52	29	I/O	Programmable general purpose input and output	
GPIO50	30	I/O	Programmable general purpose input and output	
GPIO51	31	I/O	Programmable general purpose input and output	
GPIO47	38	I/O	Programmable general purpose input and output	
GPIO46	39	I/O	Network Status Indication output	
GPIO38	40	I/O	Programmable general purpose input and output	
GPIO49	47	I/O	Controllable clock output	
EINT0	48	I/O	Flight mode control input	
EINT1	49	I/O	SD memory card detecting	
EINT3	53	I/O	SIM card detecting	
PWM				
PWM	46	I/O	Pulse-width modulation output	If these pins are unused, keep open, VDD_1V8 domain
Antenna interface				
MAIN_ANT	26	I/O	Connect to main antenna	

DIV_ANT	43	I/O	Connect to diversity antenna	
others				
NC	21			Keep open

3.3. Package Dimensions

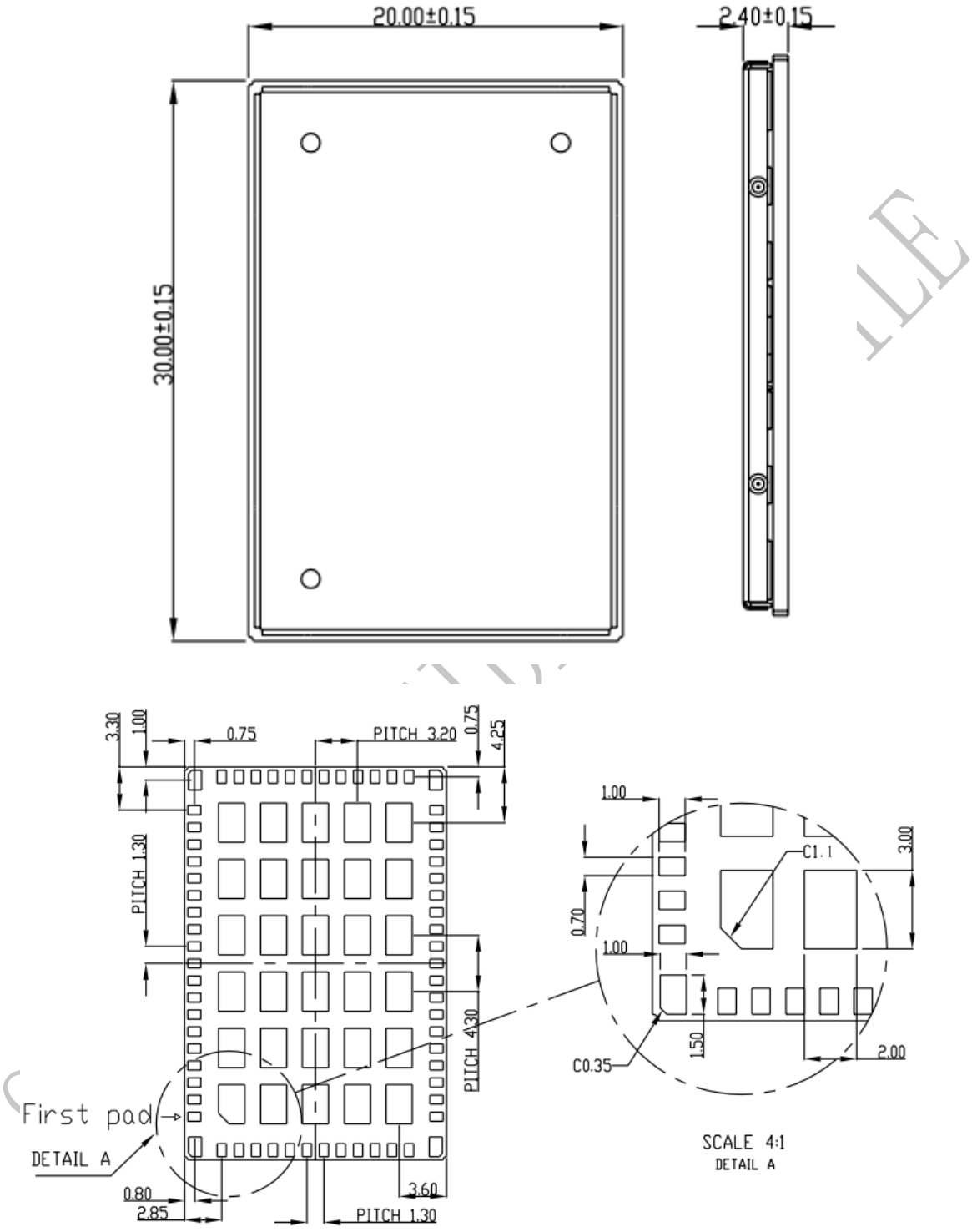

Figure 3: Dimensions of SIM5350 (Unit: mm)

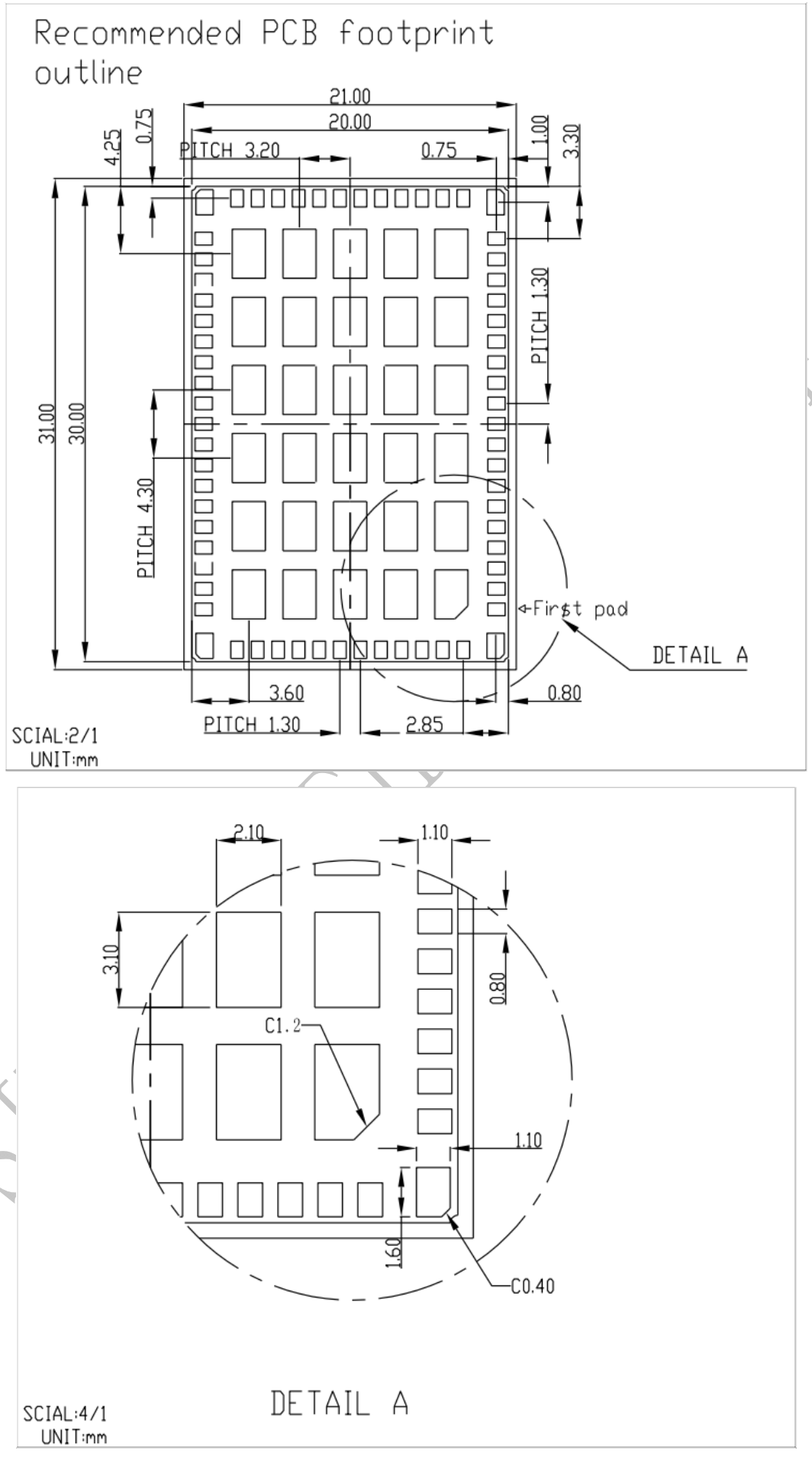

Figure 4: Recommended PCB Footprint (Unit: mm)

4. Application Interface

4.1. Power Supply

The recommended power supply voltage of SIM5350 is 3.3V+0.3V/-0.1V, including VCC_RF and VCC_BB. The transmitting burst will cause voltage drop and the power supply must be able to provide sufficient current up to 2A. For the VCC_RF input, 2 bypass capacitors (low ESR) such as 220 µF are strongly recommended. Increase the 33PF and 10PF capacitors can effectively eliminate the high frequency interference. A 5.1V/500mW zener diode is strongly recommended, which can prevent voltage surges damage on chip. The capacitors and diode should be placed as close as possible to SIM5350 VCC_RF pins.

For the VCC_BB input, a bypass capacitor (low ESR) such as 100 µF is strongly recommended. Increase the 33PF and 10PF capacitors can effectively eliminate the high frequency interference. A 5.1V/500mW zener diode is strongly recommended, which can prevent voltage surges damage on chip (Can be shared with the zener diode on the VCC_RF net). The capacitors and diode should be placed as close as possible to SIM5350 VCC_BB pins.

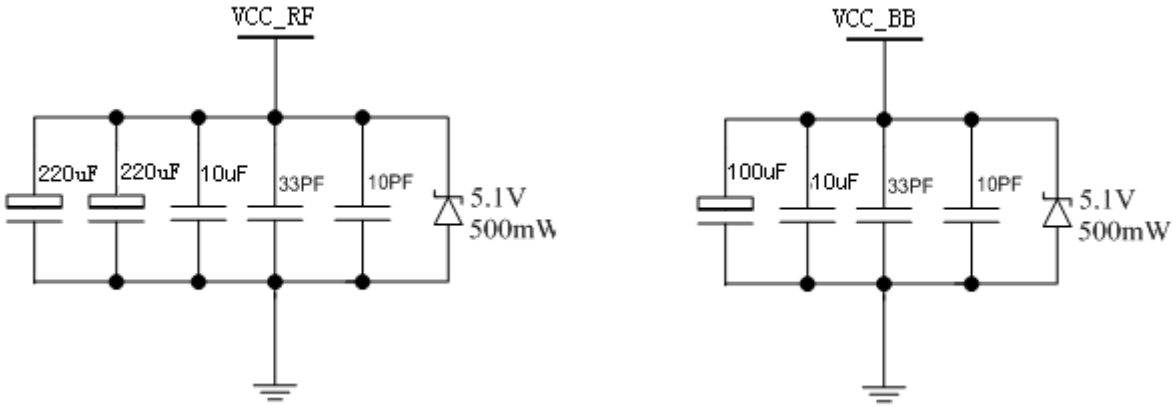

Figure 5: VCC_BB &VCC_RF Input Reference Circuit

Table 6: Recommended Zener Diode

	Vendor	Part number	Power(watts)	Package
1	On semi	MMSZ5231BT1G	500mW	SOD123
2	Prisemi	PZ3D4V2H	500mW	SOD323
3	Prisemi	PZ5D4V2H	500mW	SOD523
4	Vishay	MMSZ4689-V	500mW	SOD123
5	Crownpo	CDZ55C5V1SM	500mW	0805

The following figure is a reference design of +5V input power supply linear regulator with +3.3V output.

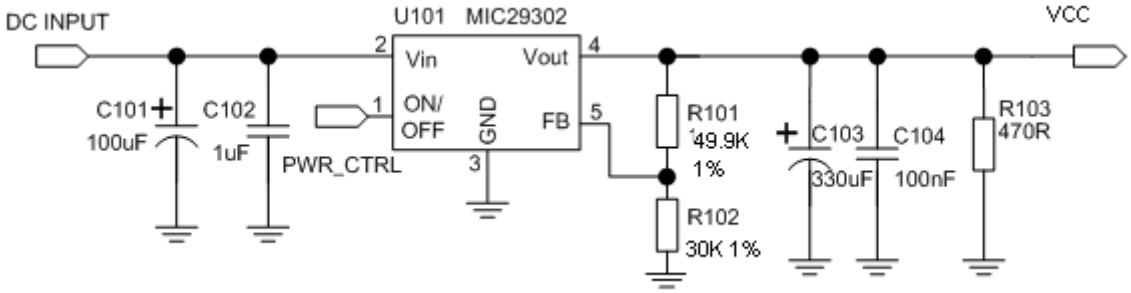

Figure 6: LDO power supply Reference Circuit

4.2. Hardware Reset

The RESET pin could be used to reset the module. This function is used as an emergency reset. User can pull the RESET pin to ground, then the module will reset. Reset pin is already pulled up in module, so the external pull-up resistor is not necessary. The following figure is the interior circuit of reset.

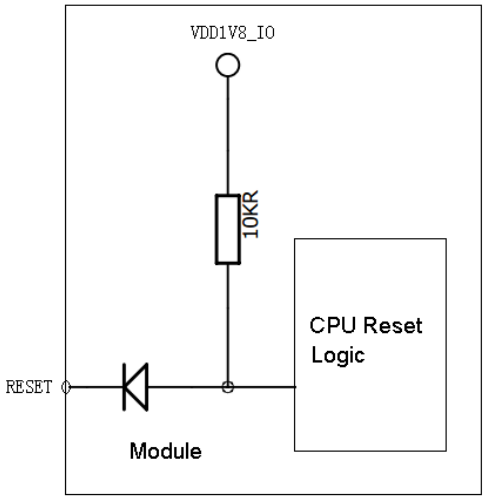

Figure 7: Reset Interior Circuit

The following table is the electrical characteristics of reset pin.

Table 7: RESET Electrical Characteristic

Symbol	Parameter	Min	Type	Max	Unit
V_{IH}	High-level input voltage	1.7	1.8	--	V
V_{IL}	Low-level input voltage	-	-	0.3	V
$T_{high-setup}$	After power up AND-NOT operation time(keep high level or keep open)	250	-	-	ms
$T_{low-hold}$	Reset low level hold on time	300	-	-	us

The low level pulse time must is longer than 300us, the following figure is reset timing.

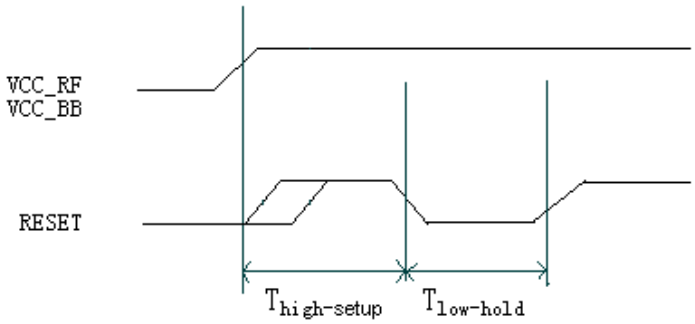

Figure 8: Reset timing

4.3. Power Saving Mode

SIM5350 has two power saving modes: minimum functionality mode and sleep mode. When SIM5350 is in sleep mode and minimum functionality mode, the current of module is lowest.

4.3.1. Minimum Functionality Mode and Sleep Mode

The AT command “AT+CFUN=<fun>” can be used to set SIM5350 into minimum functionality.
There are three functionality modes, which could be set by the AT command “AT+CFUN=<fun>”. The command provides the choice of the functionality levels <fun>=0, 1, 4.

- AT+CFUN=0: Minimum functionality.
- AT+CFUN=1: Full functionality (default).
- AT+CFUN=4: Flight mode (disable RF function).

Table 8: The Current Consumption of Minimum Functionality Mode (BS-PA-MFRMS=5)

<fun>	Current consumption(mA) (sleep mode)
0	1.4
1	1.6
4	1.4

Minimum functionality mode minimizes the current consumption to the lowest level. If SIM5350 is set to minimum functionality by “AT+CFUN=0”, the RF function and SIM card function will be disabled. In this case, the serial port and USB port are still accessible, but all AT commands correlative with RF function and SIM card function will not be accessible.
Note: For detailed information about the AT Command “AT+CFUN=<fun>”, please refer to document [1].

If USB HOST sends USB suspend request and UART_DTR is not pulled down, SIM5350 will enter sleep mode automatically for reducing power consume, when peripheral equipment of SIM5350 stops working, and module has no on air or audio activity required and no hardware interrupt (such as GPIO interrupt or data on serial port). In sleep mode, SIM5350 can still receive paging or SMS from network.
Note: If USB interface is used, SIM5350 could enter sleep mode, only when USB HOST supports USB suspend mode.

4.3.2. Wake Up of SIM5350 from Sleep Mode

When SIM5350 is in sleep mode, the following methods can wake up the module:

- USB HOST sends USB resume request.
- Pull down DTR pin. The serial port will be active after DTR pin is pulled to low level.
- Receive a voice or data call from network.
- Receive a SMS from network.
- Receive external interrupt

4.4. USB 2.0

SIM5350 is compliant with USB 2.0 specification. It supports full-speed and high- speed when acting as a peripheral device.

4.4.1. USB port Specification

SIM5350 could achieve data transfer, voice call, debug and software download, etc, through USB interface. When module is powered on, and connected USB_DP, USB_DM and GND to PC, and driver installed successfully, then 3 COM port, 1 modem port and 1 removable disk could be recognized by the USB HOST.

The following diagram is the recommended connection circuit.

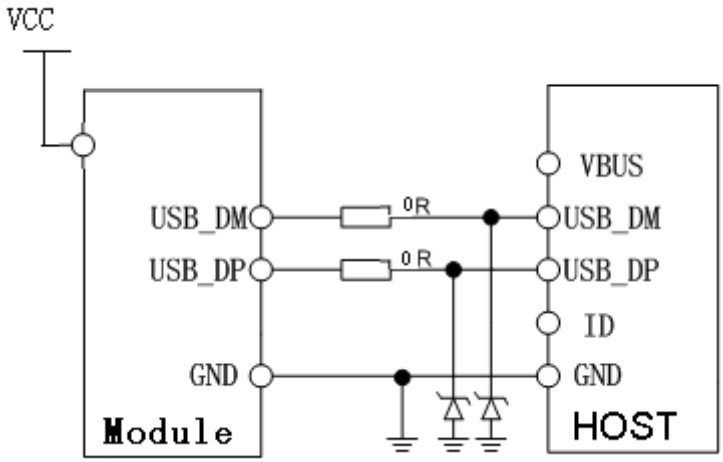

Figure 9: USB Reference Circuit

The TVS on USB data lines should be less than 5pf, and traced by 90Ohm+/-10% differential impedance.

Table 9: USB port Specification

Port Name	Description
USB Application Port	Module could be controlled by sending AT command to USB Application Port.
USB Debug Port	Module could be debugged by grabbing log through USB Debug Port.
USB Speech Port	Voice call could be achieved through USB Speech Port.
Modem	Module could transfer data through Modem.
Removable Disk	SDIO could be controlled through Removable disk.

4.4.2. Firmware Update

If users need to upgrade through USB port, it is necessary to power on SIM5350 first, then connect USB_DP, USB_DM, GND to USB HOST, then send AT command “AT+ESWM=3,0” to switch mode for download mode ,and then reset module, when module will enter USB download mode automatically.

Note: About AT command “AT+ESWM=3,0”, for more details, please refer to document [1].

4.5. Serial Interface

SIM5350 provides one unbalanced asynchronous serial interface. The module is designed as a DCE (Data Communication Equipment). The following table shows pin definition about serial interface.

Table 10: Serial Interface Pin Definition

Pin Name	Pin Number	Description
UART_TXD	17	Transmit data
UART_RXD	18	Receive data

UART_CTS	19	Clear to send
UART_RTS	20	Request to send
UART_DCD	35	Data carrier detect
UART_RI	36	Ring indicator/wake up host（DTE）
UART_DTR	37	Data terminal ready/wake up SIM5350(DCE)

Note: Hardware flow control is disabled by default. The AT command "AT+IFC=2,2" can enable hardware flow control. The AT command "AT+IFC=0,0" can disable hardware flow control. For more details please refer to document [1]

Serial interface multiplexing function is described in the following table.

Table 11: Multiplexing Function of Serial Interface

Name	Pin	Default function	Second function
UART_TXD	17	UART_TXD	GPIO60
UART_RXD	18	UART_RXD	GPIO59
UART_CTS	19	UART_CTS	GPIO57
UART_RTS	20	UART_RTS	GPIO58
UART_DCD	35	UART_DCD	GPIO39
UART_RI	36	UART_RI	GPIO44
UART_DTR	37	UART_DTR	EINT2

Note: serial interface can be control by AT command. For more details please refer to document [1]

4.5.1. Function of Serial Interface

Serial port:

- Full modem device.
- Contains data lines TXD and RXD, hardware flow control lines RTS and CTS, status lines DTR, DCD and RI.
- Serial port can be used for AT communication. Serial port supports the following baud rates:
  1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200bps

4.5.2. Serial Interface Connection

The following figure shows the connection between module and the client (DTE).

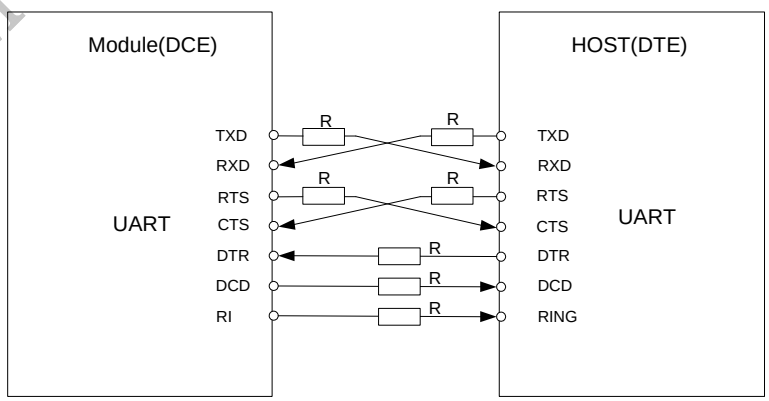

Figure 10: Serial Interface Connection

4.5.3. RI Behaviors

If UART interface is used in Null Modem, the pin “RI” can be used as an interrupt signal to HOST. Normally it will keep high logic level until certain condition such as receiving SMS, voice call (CSD, video) or URC reporting, then “RI” will change to low logic level to inform the master (client PC). It will stay low until the master clears the interrupt event with AT command.

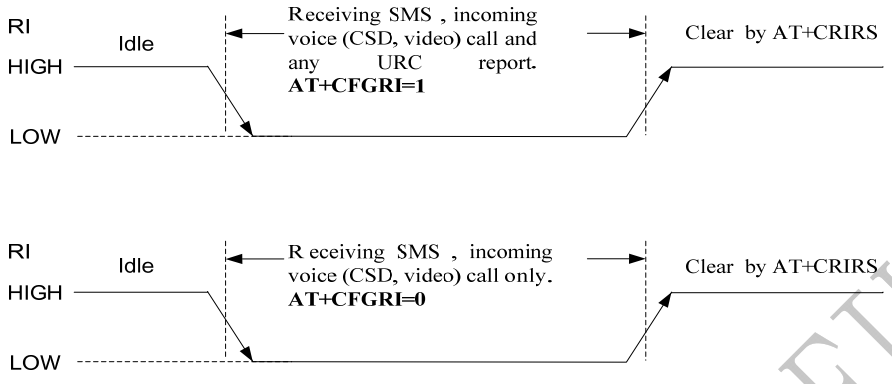

Figure 11: RI behaviour in NULL Modem

If Full Modem is used to establish communication between devices, the pin “RI” is another operation status. Initially it keeps high, when a voice call or CSD call comes, the pin “RI” will change to low for about 5900ms, then it will return to high level for 100ms. It will repeat this procedure until this call is answered or hung up.

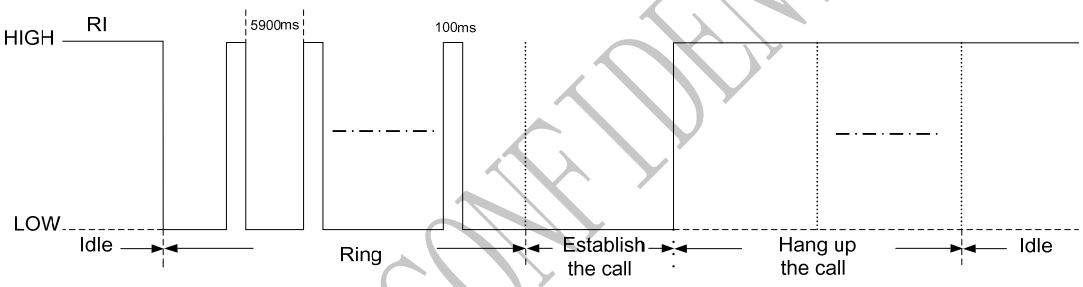

Figure 12: RI behaviour in FULL Modem

To comply with RS-232 protocol, the RS-232 level shifter chip should be used to connect SIM5320 to the RS-232-C interface. In this connection, the TTL level and RS-232 level are converted mutually. SIMCom recommends that the SP3238ECA chip is used with full modem. For more information please refers to the RS-232 chip datasheet.

However, if the module is used as caller, the RI will remain high. Please refer to the following figure.

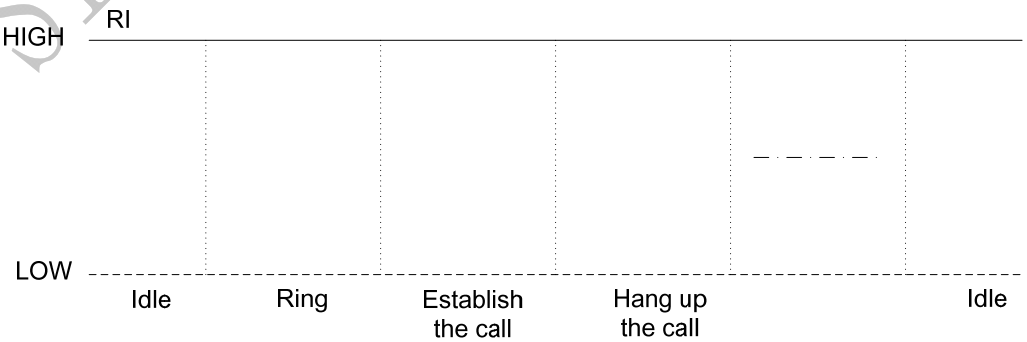

Figure 13: RI behavior as a caller

4.6. SIM Card Interface

The SIM interface complies with the GSM Phase 1 specification and the new GSM Phase 2+ specification for FAST 64 kbps SIM card. Both 1.8V and 3.0V SIM card are supported. The SIM interface is powered from an internal regulator in the module.

Table 12: SIM Pin Definition

Pin Name	Pin Number	Description
V_USIM	58	Voltage supply for SIM card. Support 1.8V or 3V SIM card
USIM_DATA	57	SIM data input/output
USIM_CLK	56	SIM clock
USIM_RST	55	SIM reset

4.6.1. SIM card Application

It is recommended to use an ESD protection component such as ST (www.st.com) ESDA6V1W5 or ON SEMI (www.onsemi.com) SMF05C. The 22Ohm resistors are used to match impedance between module and SIM card. The SIM peripheral circuit should be close to the SIM card socket.

For the recommended SIM card holder, please refer to the following figure.

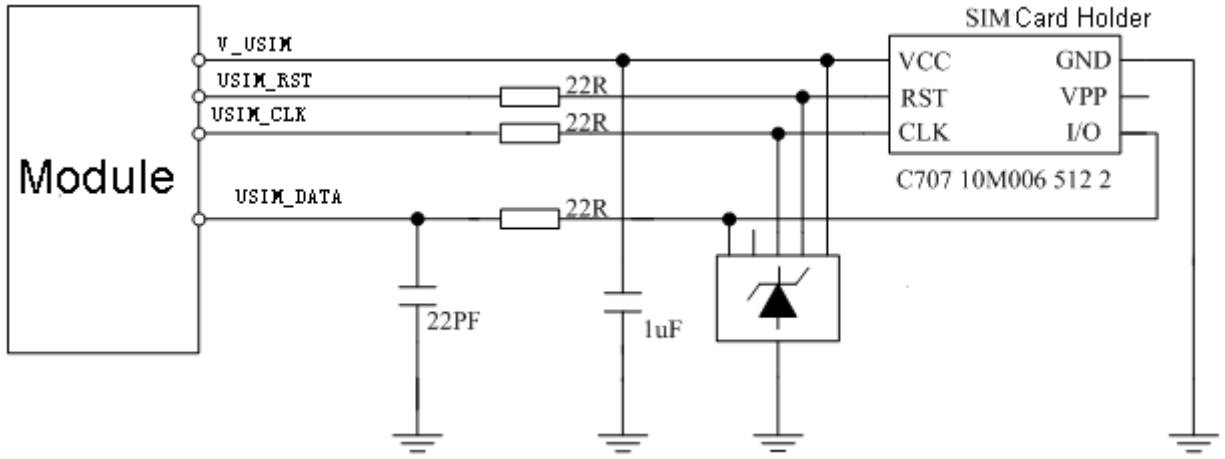

Figure 14: SIM card holder circuit

4.6.2. SIM Card Design Proposal

SIM card circuit is susceptible to be interfered, causing the SIM card failure or some other issues, so it is strongly recommended to follow these guidelines while designing:

- Make sure that SIM card holder stays away from GSM antenna while in PCB layout;
- SIM traces should be kept away from RF lines, VBAT and high-speed signal lines, and must be as short as possible;
- Keep good connectivity between SIM holder's GND and module's GND;
- It is recommended to do some protection on SIMCLK to keep away from the interference;
- It is recommended to place a 1uF capacitor on VSIM line and keep close to the holder;
- Place some TVS, the parasitic capacitance should not exceed 50pF, and cascade 22Ohm resistor to enhance ESD protection.

4.6.3. Design Considerations for SIM Card Holder

Amphenol C707 10M006 5122 is recommended to use for 6-pin SIM card holder. User can visit http: //www.amphenol.com for more information about the holder.

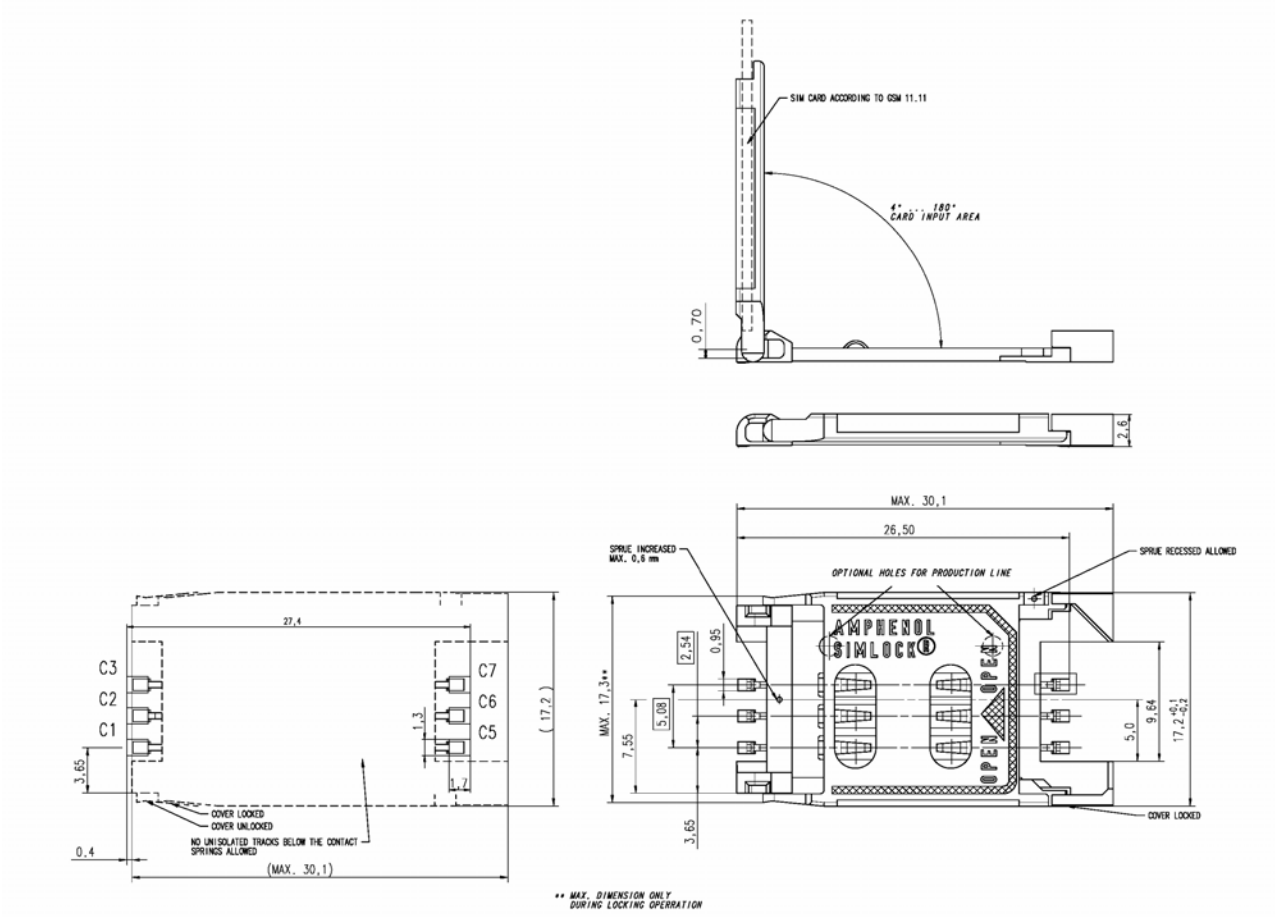

Figure 15: Amphenol C707 10M006 5122 SIM card holder

Table 13: Pin description (Amphenol SIM card holder)

Pin name	Signal	Description
C1	VSIM	SIM card power supply
C2	SIM_RST	SIM card reset
C3	SIM_CLK	SIM card clock
C5	GND	Connect to GND
C6	VPP	Not connect
C7	SIM_DATA	SIM card data I/O

4.7. PCM Interface

SIM5350 provides a hardware PCM interface.

Table 14: PCM Pin Definition

Pin Name	Pin Number	Description
PCM_SYNC	9	PCM synchrony, Internal 4.7K pull-down for system configure
PCM_DIN	10	PCM data input,
PCM_DOUT	11	PCM data output, Internal 4.7K pull-down for system configure
PCM_CLK	12	PCM clock

Note: If PCM_SYNC and PCM_DOUT are unused, please keep them open.

PCM multiplexing function is described by following table.

Table 15: PCM Multiplexing Function

Name	Pin number	Default function	Second function
PCM_SYNC	9	PCM_SYNC	GPIO6
PCM_DIN	10	PCM_DIN	GPIO4
PCM_DOUT	11	PCM_DOUT	GPIO7
PCM_CLK	12	PCM_CLK	GPIO5

SIM5350 PCM interfaces only supply master mode, data length is 16 bits (linear), and PCM clock rate is 512KHZ.

Table 16: PCM Specification

Characteristics	Specification
Line Interface Format	Linear(Fixed)
Data length	16bits
PCM Clock/Sync Source	Master Mode(Fixed)
PCM Clock Rate	512Khz (Fixed)
PCM Sync Format	Short sync/Long sync both support
Data Ordering	MSB/LSB

Note: PCM interface can be controlled by AT command. For more details please refer to document [1]

Please refer to the following figure for PCM design.

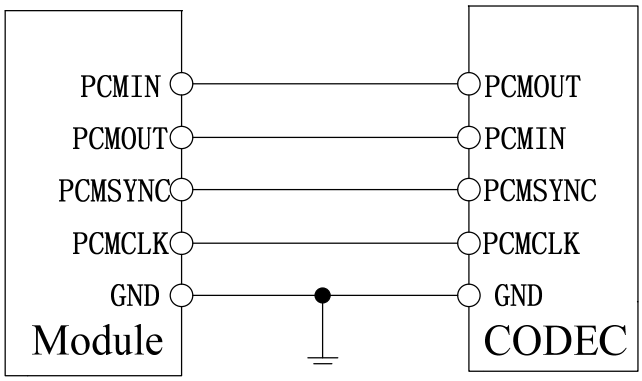

Figure 16: PCM Reference Circuit

0R resistors could be added in PCM lines for debugging.

4.8. SDIO Interface

SIM5350 provides a hardware SDIO2.0 interface, which fully supports the SD memory card bus protocol as defined in SD Memory Card Specification Part 1 Physical Layer Specification version 2.0, and also partially supports SDIO card specification version 2.0.
Please refer to the following table for SDIO pin definition.

Table 17: SDIO Pin Definition

Pin Name	Pin Number	Description
MCCM	2	SDIO data/command control
MCCK	3	SDIO clock output
MCDA0	4	SDIO data 0
MCDA1	5	SDIO data1
MCDA2	6	SDIO data2
MCDA3	7	SDIO data3

SDIO multiplexing function is described by following table.

Table 18: SDIO Multiplexing Function

Name	Pin number	Default function	Second function
MCCM	2	MCCM	GPIO61
MCCK	3	MCCK	GPIO66
MCDA0	4	MCDA0	GPIO62
MCDA1	5	MCDA1	GPIO63
MCDA2	6	MCDA2	GPIO64
MCDA3	7	MCDA3	GPIO65

Note: SDIO interface can be control by AT command. For more details please refer to document [1]

Please refer to the following figure for SDIO design.

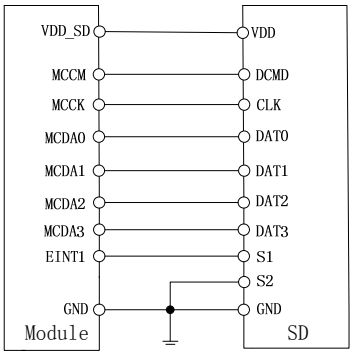

Figure 17: SDIO Reference Circuit

0R resistors could be added in SDIO lines for debugging.

4.9. I2C BUS

SIM5350 provides an I2C interface, which supports I2C protocol fully. Please refer to the following table for I2C pin definition.

Table 19: I2C Pin Definition

Pin Name	Pin Number	Description
SCL	15	I2C clock line
SDA	16	I2C data line

I2C multiplexing function is described in the following table.

Table 20: I2C Multiplexing Function

Name	Pin number	Default function	Second function
SCL	15	SCL	GPIO2
SDA	16	SDA	GPIO3

Note: I2C interface can be controlled by AT command. For more details please refer to document [1]

Please refer to the following figure for I2C design.

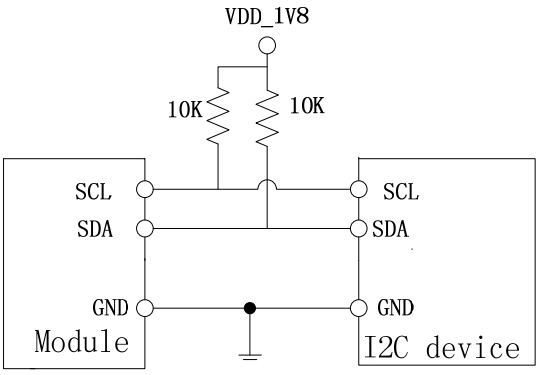

Figure 18: I2C Reference Circuit

0R resistors could be added in I2C lines for debugging.

4.10.GPIO

SIM5350 provides up to 12 GPIO pins. All GPIOs can be configured as inputs or outputs by AT command. Please refer to document [1] for details.

Table 21: GPIO Pin Definition

Pin Name	Pin Number	Description
GPIO53	22	Programmable general purpose input and output
GPIO54	23	Programmable general purpose input and output
GPIO52	29	Programmable general purpose input and output
GPIO50	30	Programmable general purpose input and output
GPIO51	31	Programmable general purpose input and output
GPIO47	38	Programmable general purpose input and output
GPIO46	39	Network Status Indication output
GPIO38	40	Programmable general purpose input and output
GPIO49	47	Controllable clock output
EINT0	48	Flight mode control input
EINT1	49	SD memory card detecting
EINT3	53	SIM card detecting

4.10.1. Network Status Indication

The GPIO46 pin can be used to drive a network status indication LED by default. Its status is listed by following table.

Table 22: Network Status Indication Pin Status

GPIO46 Status	Working Status
On	Searching Network/Call Connect
200ms On, 200ms Off	Data Transmit
800ms On, 800ms Off	Registered network
Off	Power off / Sleep

Please refer to the following figure for network status indication LED design.

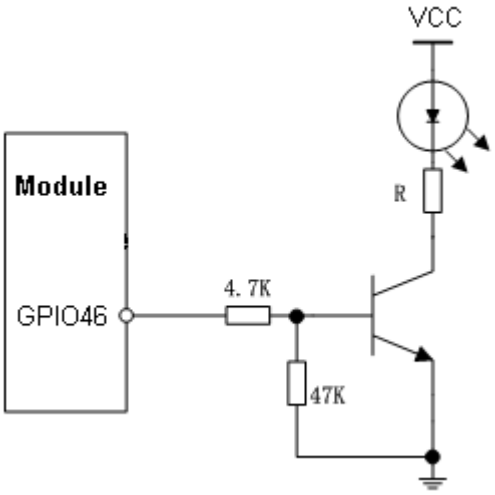

Figure 19: NETLIGHT Reference Circuit

4.10.2. Controllable Clock Output

The GPIO49 pin can be used to output a clock by default. It can be used for PCM codec chip clock source.

4.10.3. Flight Mode Control

The EINT0 pin controls SIM5350 module to enter or exit the Flight mode by default. In Flight mode, SIM5350 closes RF function to prevent interference with other equipments or minimize current consumption.

Bidirectional ESD protection component is suggested to add near the switch.

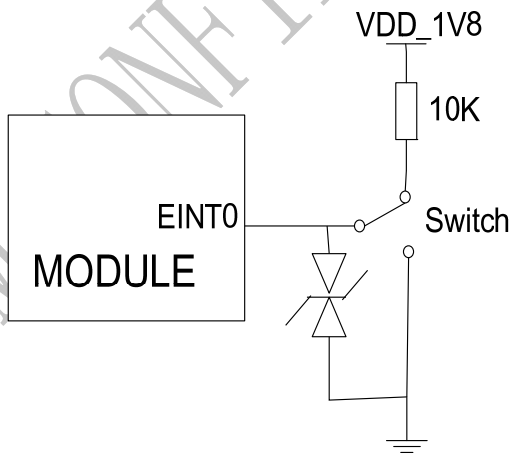

Figure 20: Flight Mode Switch Reference Circuit

Table 23: Flight mode control Function

EINT0 status	Module operation
Low Level	Flight Mode: RF is closed.
High Level	Normal Mode: RF is working.

4.10.4. SD Memory Card Detecting

The EINT1 pin can be used to detect SD memory card inserting by default.

4.10.5. SIM Card Detecting

The EINT3 pin can be used to detect SIM card inserting by default.

4.11.PWM

SIM5350 provides a PWM which can be used to drive a vibrator, or a backlight LED for display or keyboard. PWM output discrete frequency varies from 0 to 80MHz and duty cycle varies from 0% to 100%. But the frequency and duty cycle must meet the following conditions:

- PWM output frequency: F = CLK/(PWM_COUNT+1);
- PWM output duty cycle: D = PWM_THRES/(PWM_COUNT+1);
- CLK could only be selected among 4KHZ, 8KHZ, 16KHZ, and 32KHZ, 10MHZ, 20MHZ, 40MHZ and 80MHZ.
- The range of PWM_COUNT and PWM_THRES is 0 to 0x1FFF.

Note: The PWM output frequency and duty cycle could be set with AT command "AT+CPWMCLKS" and "AT+CPWM". For details, please refer to document [1].

A typical buzzer circuit is in the following figure.

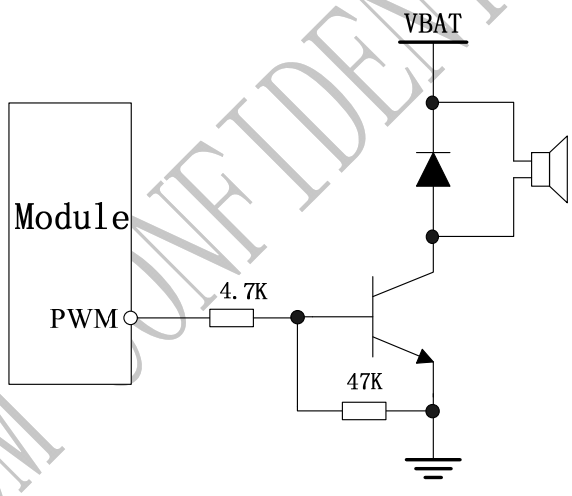

Figure 21: PWM Reference Circuit

Table 24: PWM Pin Definition

Pin Name	Pin Number	Description
PWM	46	Pulse-Width Modulation output

4.12.LDO

SIM5350 provides 2 LDO output pins.

Table 25: LDO Pin Definition

Pin Name	Pin Number	Description
VDD_SD	1	2.8/3.0/3.1/3.3V Configurable LDO output, default 3.0V output, maximum output current is 100mA
VDD_1V8	14	1.8V fixed LDO output, maximum output current is 30mA

Note: The VDD_SD output voltage could be set with AT command "AT+CLDOV". For details, please refer to document [1].

VDD_SD LDO could be used for SDIO interface power supply. VDD_1V8 LDO is only suggested to use for module's poll-up circuits power supply.

4.13.Antenna Interface

SIM5350 has 2 antennas, one of which is the main GSM/WCDMA antenna; the other is WCDMA diversity antenna.

4.13.1. Recommended Antenna Characteristics

Recommended antenna characteristics of SIM5350 are described by two following tables.

Table 26: Recommended Passive Antenna Characteristics

Passive	Recommended standard
Direction	omnidirectional
Gain	> -3dBi (Avg)
Input impedance	50 ohm
Efficiency	> 50 %
VSWR	< 2

Table 27: Recommended Active Antenna Characteristics

Band	Performance	
	TRP	TIS
GSM850	≧ 29dBm	≦ -104dBm
EGSM900	≧ 29dBm	≦ -104dBm
DCS1800	≧ 26dBm	≦ -104dBm
PCS1900	≧ 26dBm	≦ -104dBm
WCDMA B1	≧ 19dBm	≦ -104dBm
WCDMA B2	≧ 19dBm	≦ -104dBm
WCDMA B5	≧ 19dBm	≦ -104dBm
WCDMA B8	≧ 19dBm	≦ -104dBm

4.13.2. The Difference between Main and Diversity Antenna

The differences between main antenna and diversity antenna are listed in the following tips:

- MAIN_ANT pad is the main antenna pad, which is a GSM/WCDMA sending and receiving main signals pad. In normal network connected status, Main antenna works all the time.
- DIV_ANT pad is the diversity antenna pad, which is a WCDMA receiving signals pad. When voice call function is being used, diversity antenna works only in weak signal. When data transfer function is being used, diversity antenna works all the time

4.13.3. Antenna Design Proposals

Please follow the design proposals below about the antenna.

- Please keep two antennas away from each other as far as possible.
- The PCB layout lines from module pads to 2 antenna pads must be traced by 50Ohm+/-10% impedance.
- The adjacent layer GND below 2 antenna pads should be cut away for reducing parasitic capacitance and controlling impedance.

Two RF connectors and two matching networks should be added between module pads to antenna pads, for antenna debugging and testing. Please refer to the following recommended design. In the following figure, the main antenna matching network contains R101, C101 and C102, and the diversity antenna matching network contains R102, C103 and C104, the value of the 6 passive devices will be adjusted and fixed after PCB and antenna selected. OR resistors are mounted on R101 and R102, and C101, C102, C103 and C104 are not mounted on by default.

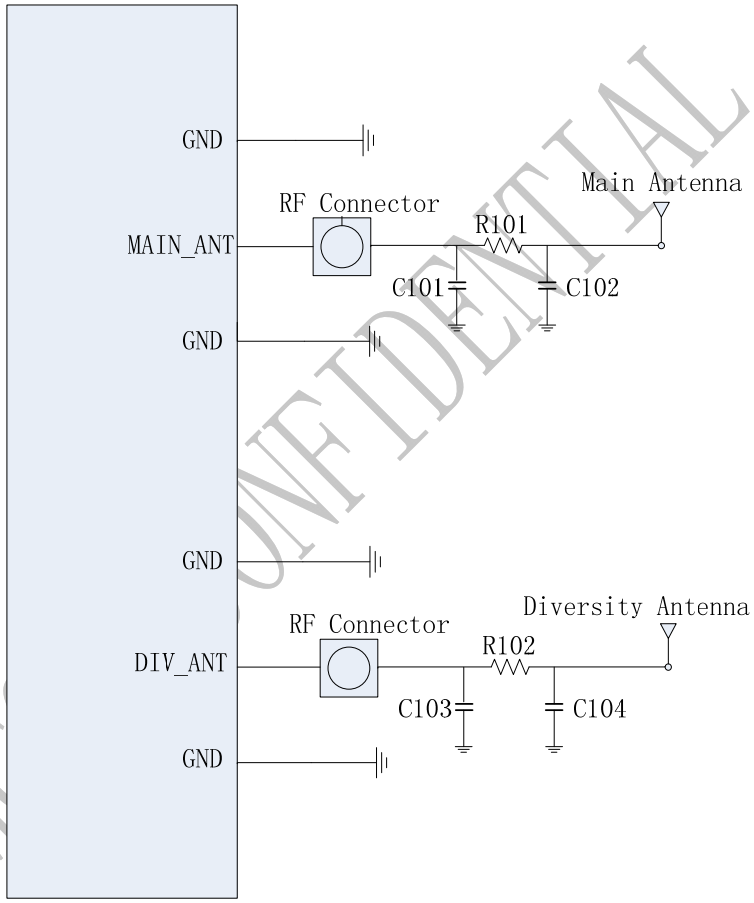

Figure 22: Main and Diversity antenna Reference Circuit

Antenna circuit could be simplified for space constraints or other reasons. Please refer to the following simplified circuit.

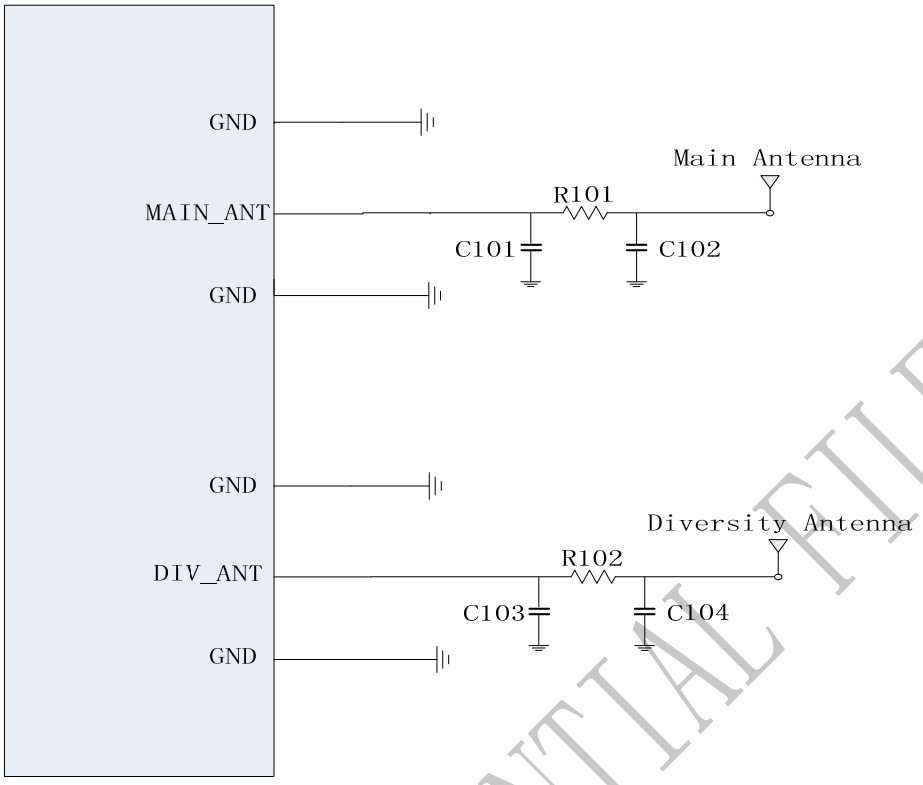

Figure 23: Main and Diversity antenna Simplified Reference Circuit

Please follow the design proposals below about RF devices placing and tracing.

- RF connectors could be placed near to module pads.
- Matching networks should be placed near to 2 antenna pads.
- The PCB layout lines from module pads to 2 antenna pads must be traced by 50Ohm+/-10% impedance.
- The PCB layout lines from module pads to 2 antenna pads must be kept away from high speed signals and other electromagnetic interference.

5. PCB Design

Electronic products with good performance depend on good PCB design in a manner. Products without good PCB design could appear many issues, for example TDD noise, SIM card can't be found, etc. If device placement could be dealt with reasonably, traces could be optimized, the development cycle time and cost will be reduced

5.1 Module Pin Assignment

Following figure is the overview of module pin assignment.

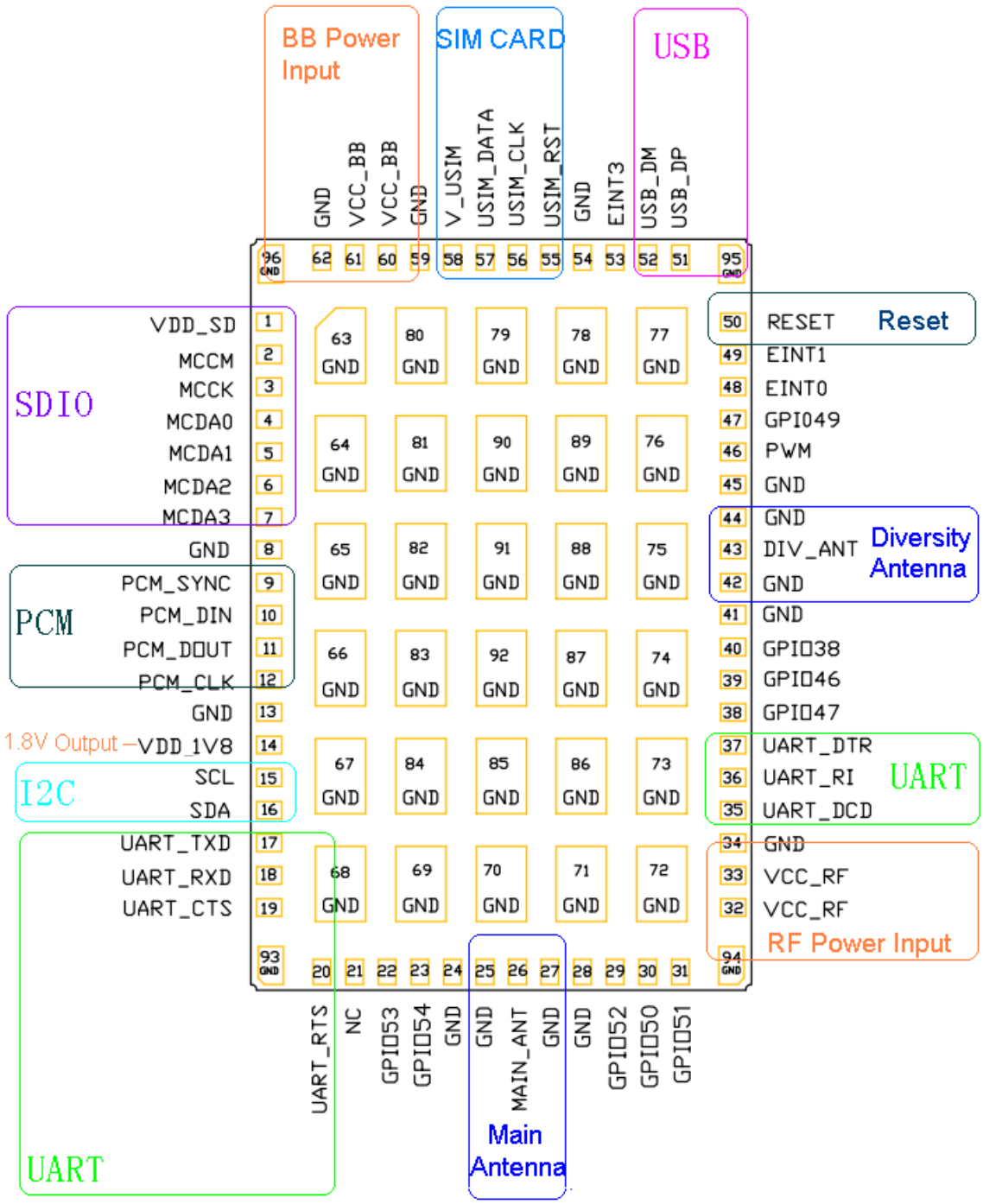

Figure 24: Module Pin Assignment (Top Perspective View)

5.2 PCB Design Proposals

The circuits mentioned by following sections should be dealt with carefully.

5.2.1. Antenna

Ensure the trace from SIM5350 to antenna as short as possible. In addition, keep the distance between primary antenna and diversity antenna to be enough to avoid interference. Keep the cable of connecting antenna and PCB away from PCB circuits, especially SMPS and SIM card. The schematic diagram is shown as below:

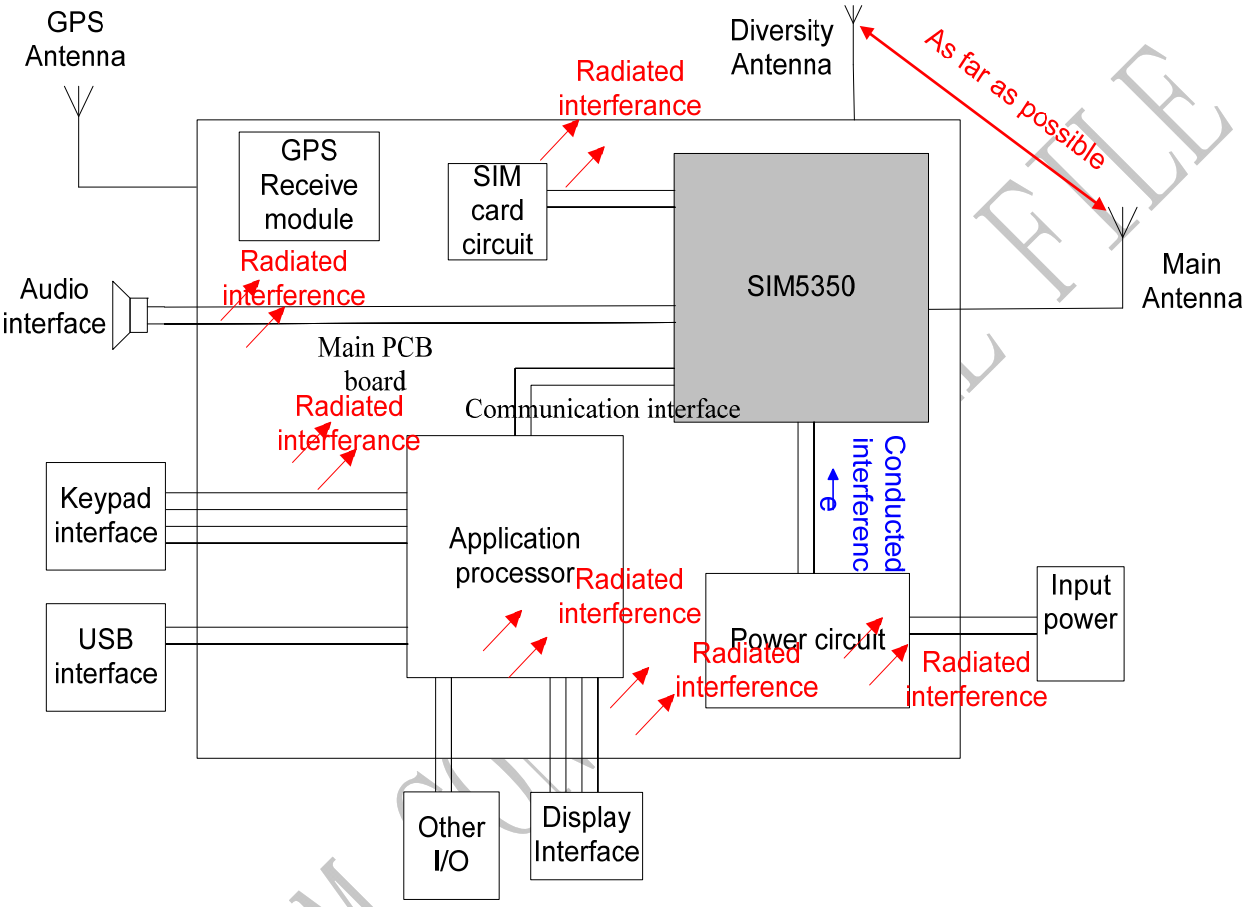

Figure 25: Antenna layout diagram

5.2.2. Power supply

The VCC_RF and VCC_BB nets should be traced as short and wide as possible. The zener diode and capacitors should be placed on VCC_RF and VCC_BB nets directly. Power supply cycle should be optimized as small as possible. Please refer to the following figure for power supply diagram.

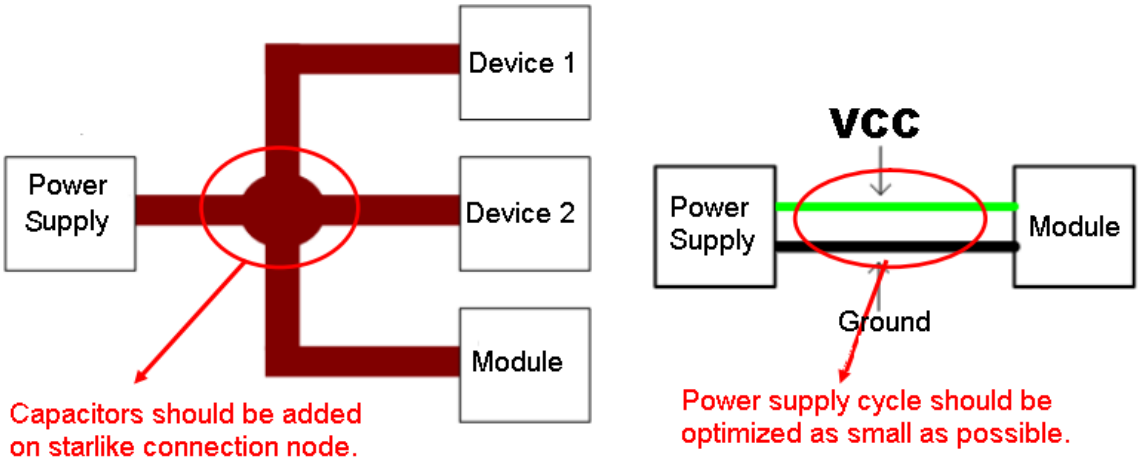

Figure 26: Power Supply diagram

5.2.3. SIM Card Holder

SIM card holder normally is the biggest device on board, the SIM circuit is easily interfered, so SIM card holder should be kept away from the RF antenna, and placed far from module as much as possible. The clock signal, data signal, reset signal and power supply lines of SIM circuit should be far away from power and high speed signal lines.

5.2.4. USB 2.0

USB data lines should be traced by 90Ohm+/-10% differential impedance as short as possible, and be surrounded by reference ground from left and right, upper and lower. One of the reference ground planes should be kept complete, the incomplete area of the other planes should be smallest.

5.2.5. Others

The serial interface, SDIO interface and PCM interface lines should be traced by group and as short as possible.

6. Electrical, Reliability and Radio Characteristics

6.1 Absolute Maximum Ratings

The absolute maximum ratings are described by the following table. Module may be damaged beyond these ratings.

Table 28: Absolute maximum ratings

Symbol	Min	Type	Max	Unit
VCC_RF,VCC_BB	0	-	3.8	V
I_I*	-	-	8	mA
I_O*	-	-	8	mA

Note: **These parameters apply to GPIO, I2C, UART, SDIO and PCM.*

6.2 Recommended Operating Temperature

Please refer to the follow table for recommended operating temperature condition.

Table 29: Operating Temperature

Parameter	Min	Type	Max	Unit
Operating temperature	-40	+25	+85	℃
Storage temperature	-45	--	+90	℃

6.3 Digital Interface Characteristics

Table 30: VDD_1V8 Domain Digital Interface Characteristics (GPIO, I2C, UART, PCM)*

Symbol	Parameter	Min	Type	Max	Unit
V_{IH}	High-level input voltage	0.8*VDD_1V8	VDD_1V8	VDD_1V8+0.3	V
V_{IL}	Low-level input voltage	-0.3	0	0.2*VDD_1V8	V
V_{OH}	High-level output voltage	1.53	VDD_1V8	-	V
V_{OL}	Low-level output voltage	-	0	0.27	V

Note: **These parameters apply to GPIO, I2C, UART, and PCM.*

Table 31: VDD_SD Domain Digital Interface Characteristics (SDIO)*

Symbol	Parameter	Min	Type	Max	Unit
V_{IH}	High-level input voltage	0.8*VDD_SD	VDD_SD	VDD_SD+0.3	V
V_{IL}	Low-level input voltage	-0.3	0	0.2*VDD_SD	V

V_{OH}	High-level output voltage	2.38	VDD_SD	-	V
V_{OL}	Low-level output voltage	-	0	0.42	V

Note: **These parameters apply to SDIO.*

6.4 SIM Card Interface Characteristics

Table 32: SIM Card Interface Characteristics

Symbol	Parameter		Min	Type	Max	Unit
USIM_RST	V_{OH}	V_USIM=1.8V	0.9*V_USIM	-	-	V
		V_USIM=3.0V	0.9*V_USIM	-	-	V
	V_{OL}	V_USIM=1.8V	-	-	0.2*V_USIM	V
		V_USIM=3.0V	-	-	0.36	V
USIM_CLK	V_{OH}	V_USIM=1.8V	0.9*V_USIM	-	-	V
		V_USIM=3.0V	0.9*V_USIM	-	-	V
	V_{OL}	V_USIM=1.8V	-	-	0.12*V_USIM	V
		V_USIM=3.0V	-	-	0.4	V
USIM_DATA	V_{IH}	V_USIM=1.8V	V_USIM-0.4	-	-	V
		V_USIM=3.0V	V_USIM-0.4	-	-	V
	V_{IL}	V_USIM=1.8V	-	-	0.15*V_USIM	V
		V_USIM=3.0V	-	-	0.4	V
	V_{OH}	V_USIM=1.8V	V_USIM-0.4	-	-	V
		V_USIM=3.0V	V_USIM-0.4	-	-	V
	V_{OL}	V_USIM=1.8V	-	-	0.15*V_USIM	V
		V_USIM=3.0V	-	-	0.4	V

6.5 V_USIM Characteristics

Table 33: V_USIM Characteristics

Symbol	Parameter	Min	Type	Max	Unit
V_O	Output voltage	2.85	3.0	3.15	V
		1.7	1.80	1.9	
I_O	Output current	-	-	30	mA

6.6 VDD_SD Characteristics

Table 34: VDD_SD Characteristics

Symbol	Parameter	Min	Type	Max	Unit
V_O	Output voltage	2.65	2.80	2.95	V

		2.85	3.0	3.15	V
		2.845	3.1	3.155	V
		3.135	3.3	3.465	V
I_O	Output current	-	-	100	mA

6.7 VDD_1V8 Characteristics

Table 35: VDD_1V8 Characteristics

Symbol	Parameter	Min	Type	Max	Unit
V_O	Output voltage	1.7	1.80	1.9	V
I_O	Output current	-	-	30	mA

6.8 Current Consumption (VCC_RF, VCC_BB=3.3V+0.3V/-0.1V)

Table 36: Current Consumption

GSM Sleep mode	
GSM850	Sleep @DRX=2 1.87mA Sleep @DRX=5 1.68mA Sleep @DRX=9 1.58mA
GSM900	Sleep @DRX=2 1.87mA Sleep @DRX=5 1.68mA Sleep @DRX=9 1.58mA
DCS1800	Sleep @DRX=2 1.87mA Sleep @DRX=5 1.68mA Sleep @DRX=9 1.58mA
PCS1900	Sleep @DRX=2 1.87mA Sleep @DRX=5 1.68mA Sleep @DRX=9 1.58mA
Voice Call	
GSM850	@power level #5 <300mA,Typical 222mA
GSM 900	@power level #5 <300mA,Typical 218mA
DCS1800	@power level #0 <250mA,Typical 151mA
PCS1900	@power level #0 <250mA,Typical 137mA
GPRS Data	
DATA mode, GPRS (1 Rx,4 Tx) CLASS 12 CS4	
GSM 850	@power level #5 <660mA,Typical 530mA
GSM 900	@power level #5 <660mA,Typical 502mA
DCS1800	@power level #0 <530mA,Typical 366mA
PCS1900	@power level #0 <530mA,Typical 317mA
DATA mode, GPRS (3Rx, 2 Tx) CLASS 12 CS4	
GSM 850	@power level #5 <500mA,Typical 368mA
GSM 900	@power level #5 <500mA,Typical 353mA
DCS1800	@power level #0 <400mA,Typical 251mA
PCS1900	@power level #0 <400mA,Typical 224mA

EDGE Data	
DATA mode, EDGE(1 Rx,4 Tx) CLASS 12 MCS9	
GSM 850	@power level #8 <mA,Typical mA
GSM 900	@power level #8 <mA,Typical mA
DCS1800	@power level #2 <mA,Typical mA
PCS1900	@power level #2 <mA,Typical mA
DATA mode, EDGE(3Rx, 2 Tx) CLASS 12 MCS9	
GSM 850	@power level #8 <500mA,Typical 430mA
GSM 900	@power level #8 <500mA,Typical 427mA
DCS1800	@power level #2 <450mA,Typical 319mA
PCS1900	@power level #2 <450mA,Typical 309mA
UMTS Sleep Mode	
WCDMA B1	Sleep @DRX=9 1.52mA Sleep @DRX=8 1.68mA Sleep @DRX=6 2.15mA
WCDMA B2	TBD
WCDMA B5	Sleep @DRX=9 1.52mA Sleep @DRX=8 1.68mA Sleep @DRX=6 2.15mA
WCDMA B8	TBD
UMTS Talk	
WCDMA B1	@Power 23dBm Typical 460mA @Power 21dBm Typical 420mA @Power 10dBm Typical 231mA
WCDMA B2	TBD
WCDMA B5	@Power 23dBm Typical 467mA @Power 21dBm Typical 395mA @Power 10dBm Typical 214mA
WCDMA B8	TBD
HSDPA Data	
WCDMA B1	TBD
WCDMA B2	TBD
WCDMA B5	TBD
WCDMA B8	TBD
HSUPA Data	
WCDMA B1	TBD
WCDMA B2	TBD
WCDMA B5	TBD
WCDMA B8	TBD

Note: In above table the current consumption value is the typical one of the module tested in laboratory. In the mass production stage, there may be differences among each individual.

6.9 Electro-Static Discharge

SIM5350 is an ESD sensitive component, so more attention should be paid to the procedure of handling and packaging. The ESD test results are shown in the following table.

Table 37: ESD characteristics (Temperature: 25℃, Humidity: 45 %)

Pin	Contact discharge	Air discharge
VCC_RF,VCC_BB	±5KV	±10KV
GND	±5KV	±10KV
RXD, TXD	±3KV	±6KV
Antenna port	±4KV	±8KV
USB_DP,USB_DM	±3KV	±6KV

6.10 Radio Characteristics

6.10.1. Conducted Output Power

The following table shows SIM5350's conducted output power, comply with 3GPP TS 05.05and TS 34.121.

Table 38: Conducted Output Power

Frequency	Max	Min
GSM850	33dBm ±2dB	5dBm ± 5dB
E-GSM900	33dBm ±2dB	5dBm ± 5dB
DCS1800	30dBm ±2dB	0dBm ± 5dB
PCS1900	30dBm ±2dB	0dBm ± 5dB
GSM850 (8-PSK)	27dBm ±3dB	5dBm ± 5dB
E-GSM900 (8-PSK)	27dBm ±3dB	5dBm ± 5dB
DCS1800 (8-PSK)	26dBm +3/-4dB	0dBm ±5dB
PCS1900(8-PSK)	26dBm +3/-4dB	0dBm ±5dB
WCDMA B1	24dBm +1/-3dB	-56dBm ±5dB
WCDMA B2	24dBm +1/-3dB	-56dBm ±5dB
WCDMA B5	24dBm +1/-3dB	-56dBm ±5dB
WCDMA B8	24dBm + 1/-3dB	-56dBm ±5dB

6.10.2. Conducted Receive Sensitivity

The following table shows conducted receiving sensitivity of SIM5350.

Table 39: Conducted Receive Sensitivity

Frequency	Receive sensitivity
GSM850	< -106dBm
E-GSM900	< -106dBm
DCS1800	< -106dBm
DCS1800	< -106dBm
WCDMA B1	< -108dBm
WCDMA B2	< -108dBm
WCDMA B5	< -106dBm
WCDMA B8	< -106dBm

Remark: The data in above table are got at static condition.

6.10.3. Supported Band

The following table shows SIM5350 supported band, which complies with 3GPP spec.

Table 40: Supported Band

Frequency	Receiving	Transmission
GSM850	869 ～894 MHz	824 ～849 MHz
E-GSM900	925 ～960 MHz	880 ～915 MHz
DCS1800	1805～1880 MHz	1710～1785 MHz
PCS1900	1930～1990 MHz	1850～1910 MHz
WCDMA B1	2110～2170 MHz	1920～1980 MHz
WCDMA B2	1930～1990 MHz	1850～1910 MHz
WCDMA B5	869 ～894 MHz	824 ～849 MHz
WCDMA B8	925 ～960 MHz	880 ～915 MHz

7. Manufacturing

7.1. SIM5350 Top and Bottom View

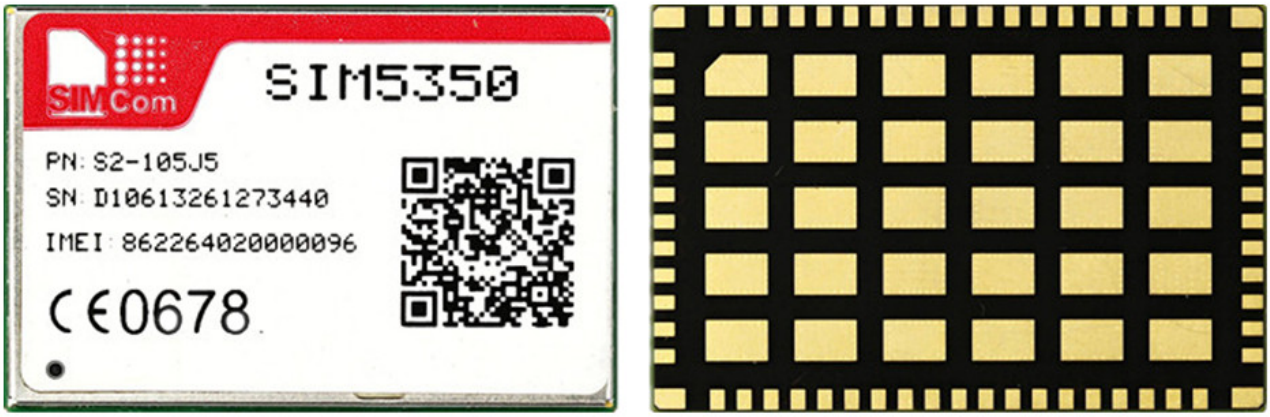

Figure 27: SIM5350 Top and Bottom View

7.2. Typical Solder Reflow Profile

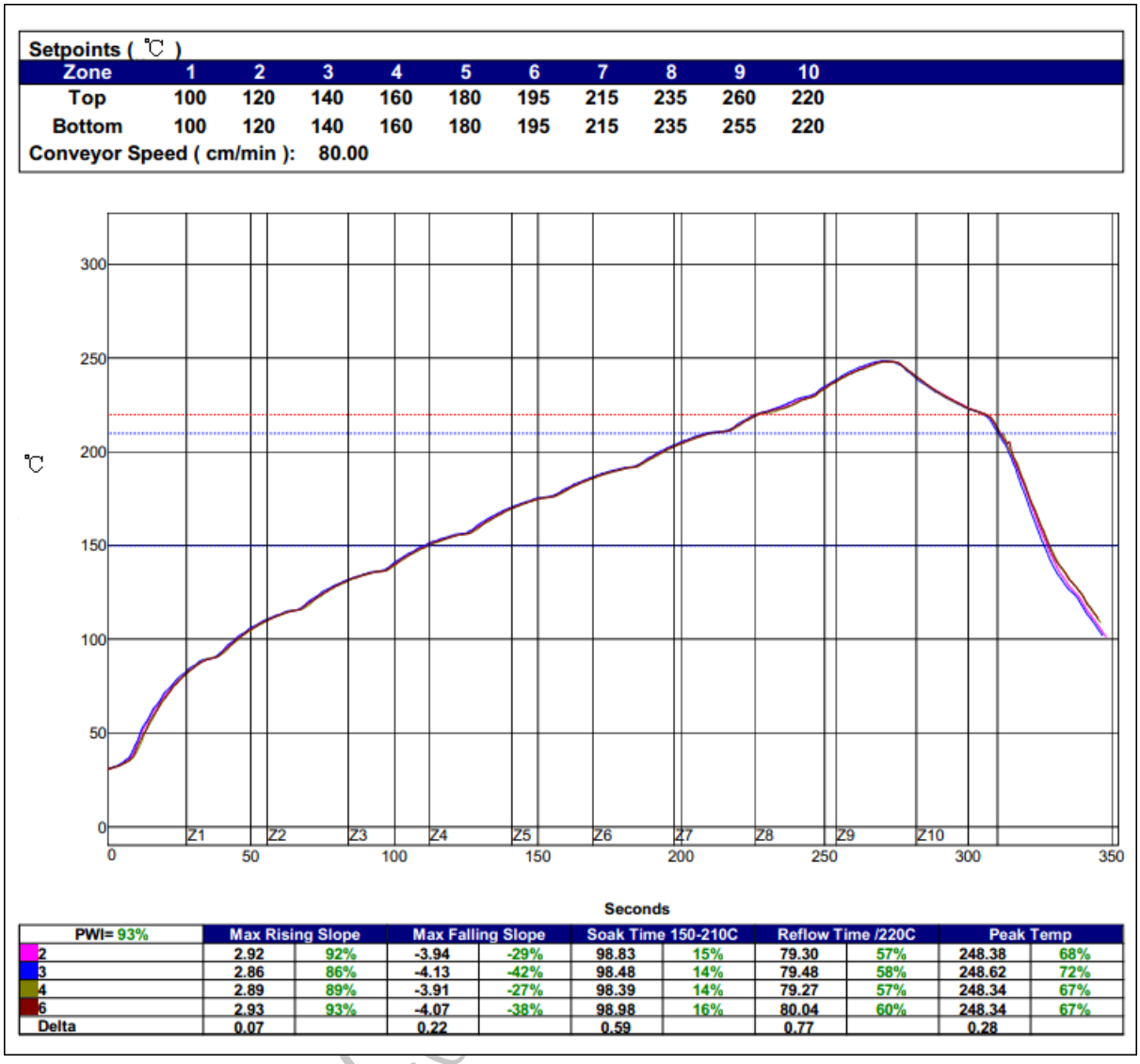

Figure 28: Typical Solder Reflow Profile

7.3. Moisture sensitivity

SIM5350 moisture sensitivity is at MSL level 5. Please refer to IPC/JEDEC specification J-STD-020C for package drying.

Table 41: Moisture Classification Level and Floor Life

MSL Level	Floor Life(out of bag) at factory ambient≦+30℃/60% RH or as stated
1	Unlimited
2	1 Year
2a	4 Weeks
3	168 Hours
4	72 Hours
5	48 Hours
5a	24 Hours
6	Mandatory bake before use. After baking, module must be reflowed within the time limit which is specified on the label.

8. Appendix

I. Related Documents

Table 42: Related Documents

SN	Document name	Remark
[1]	SIMCOM_SIM5350_ATC_EN_V1.xx.doc	
[2]	ITU-T Draft new recommendation V.25ter:	Serial asynchronous automatic dialing and control
[3]	GSM 07.07:	Digital cellular telecommunications (Phase 2+); AT command set for GSM Mobile Equipment (ME)
[4]	GSM 07.10:	Support GSM 07.10 multiplexing protocol
[5]	GSM 07.05:	Digital cellular telecommunications (Phase 2+); Use of Data Terminal Equipment – Data Circuit terminating Equipment (DTE – DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)
[6]	GSM 11.14:	Digital cellular telecommunications system (Phase 2+); Specification of the SIM Application Toolkit for the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface
[7]	GSM 11.11:	Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface
[8]	GSM 03.38:	Digital cellular telecommunications system (Phase 2+); Alphabets and language-specific information
[9]	GSM 11.10	Digital cellular telecommunications system (Phase 2); Mobile Station (MS) conformance specification; Part 1: Conformance specification
[2]	ITU-T Draft new recommendation V.25ter:	Serial asynchronous automatic dialing and control

II. Multiplexing Function List

Table 43: Multiplexing Function List

Name	Pin	Default function	Second function
UART_TXD	17	UART_TXD	GPIO60
UART_RXD	18	UART_RXD	GPIO59
UART_CTS	19	UART_CTS	GPIO57
UART_RTS	20	UART_RTS	GPIO58
UART_DCD	35	UART_DCD	GPIO39
UART_RI	36	UART_RI	Wake up HOST
UART_DTR	37	UART_DTR	Wake up SIM5350
PCM_SYNC	9	PCM_SYNC	GPIO6
PCM_DIN	10	PCM_DIN	GPIO4
PCM_DOUT	11	PCM_DOUT	GPIO7
PCM_CLK	12	PCM_CLK	GPIO5
MCCM	2	MCCM	GPIO61
MCCK	3	MCCK	GPIO66
MCDA0	4	MCDA0	GPIO62
MCDA1	5	MCDA1	GPIO63
MCDA2	6	MCDA2	GPIO64
MCDA3	7	MCDA3	GPIO65
SCL	15	SCL	GPIO2
SDA	16	SDA	GPIO3
GPIO53	22	GPIO53	
GPIO54	23	GPIO54	
GPIO52	29	GPIO52	
GPIO50	30	GPIO50	
GPIO51	31	GPIO51	
GPIO47	38	GPIO47	
GPIO46	39	Network Status Indication output	GPIO46
GPIO38	40	GPIO38	
GPIO49	47	Controllable clock output	GPIO49
EINT0	48	Flight mode control input	GPIO0
EINT1	49	SD memory card detecting	GPIO1
EINT3	53	SIM card detecting	GPIO30
PWM	46	PWM	GPIO17

III. Terms and Abbreviations

Table 44: Terms and Abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
AMR	Adaptive Multi-Rate
CS	Coding Scheme
CSD	Circuit Switched Data
CTS	Clear to Send
DTE	Data Terminal Equipment (typically computer, terminal, printer)
DTR	Data Terminal Ready
DTX	Discontinuous Transmission
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FR	Full Rate
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HR	Half Rate
IMEI	International Mobile Equipment Identity
Li-ion	Lithium-Ion
MO	Mobile Originated
MS	Mobile Station (GSM engine), also referred to as TE
MT	Mobile Terminated
PAP	Password Authentication Protocol
PBCCH	Packet Broadcast Control Channel
PCB	Printed Circuit Board
PCL	Power Control Level
PCS	Personal Communication System, also referred to as GSM 1900
PDU	Protocol Data Unit
PPP	Point-to-point protocol
RF	Radio Frequency
RMS	Root Mean Square (value)
RTC	Real Time Clock
WCDMA	Wideband Code Division Multiple Access
HSDPA	High Speed Downlink Packet Access
HSUPA	High Speed Uplink Packet Access
RX	Receive Direction
SIM	Subscriber Identification Module
SMS	Short Message Service

TE	Terminal Equipment, also referred to as DTE
TX	Transmit Direction
UART	Universal Asynchronous Receiver & Transmitter
URC	Unsolicited Result Code
USSD	Unstructured Supplementary Service Data
Phonebook abbreviations	
FD	SIM fix dialing phonebook
LD	SIM last dialing phonebook (list of numbers most recently dialed)
MC	Mobile Equipment list of unanswered MT calls (missed calls)
ON	SIM (or ME) own numbers (MSISDNs) list
RC	Mobile Equipment list of received calls
SM	SIM phonebook
NC	Not connect

IV. Safety Caution

Table 45: Safety caution

Marks	Requirements
	When in a hospital or other health care facility, observe the restrictions about the use of mobiles. Switch the cellular terminal or mobile off, medical equipment may be sensitive to not operate normally for RF energy interference.
	Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it is switched off. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. Forget to think much of these instructions may lead to the flight safety or offend against local legal action, or both.
	Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.
	Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.
	Road safety comes first! Do not use a hand-held cellular terminal or mobile when driving a vehicle, unless it is securely mounted in a holder for hands free operation. Before making a call with a hand-held terminal or mobile, park the vehicle.
	GSM cellular terminals or mobiles operate over radio frequency signals and cellular networks and cannot be guaranteed to connect in all conditions, for example no mobile fee or a invalid SIM card. While you are in this condition and need emergent help, please remember using emergency calls. In order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength. Some networks do not allow for emergency call if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may have to deactivate those features before you can make an emergency call. Also, some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.

Contact us:

Shanghai SIMCom Wireless Solutions Ltd.

Add: SIM Technology Building, No.633,Jinzhong Road, Changning District, Shanghai P.R. China 200335

Tel: +86 21 3235 3300

Fax: +86 21 3235 3301

URL: www.sim.com/wm