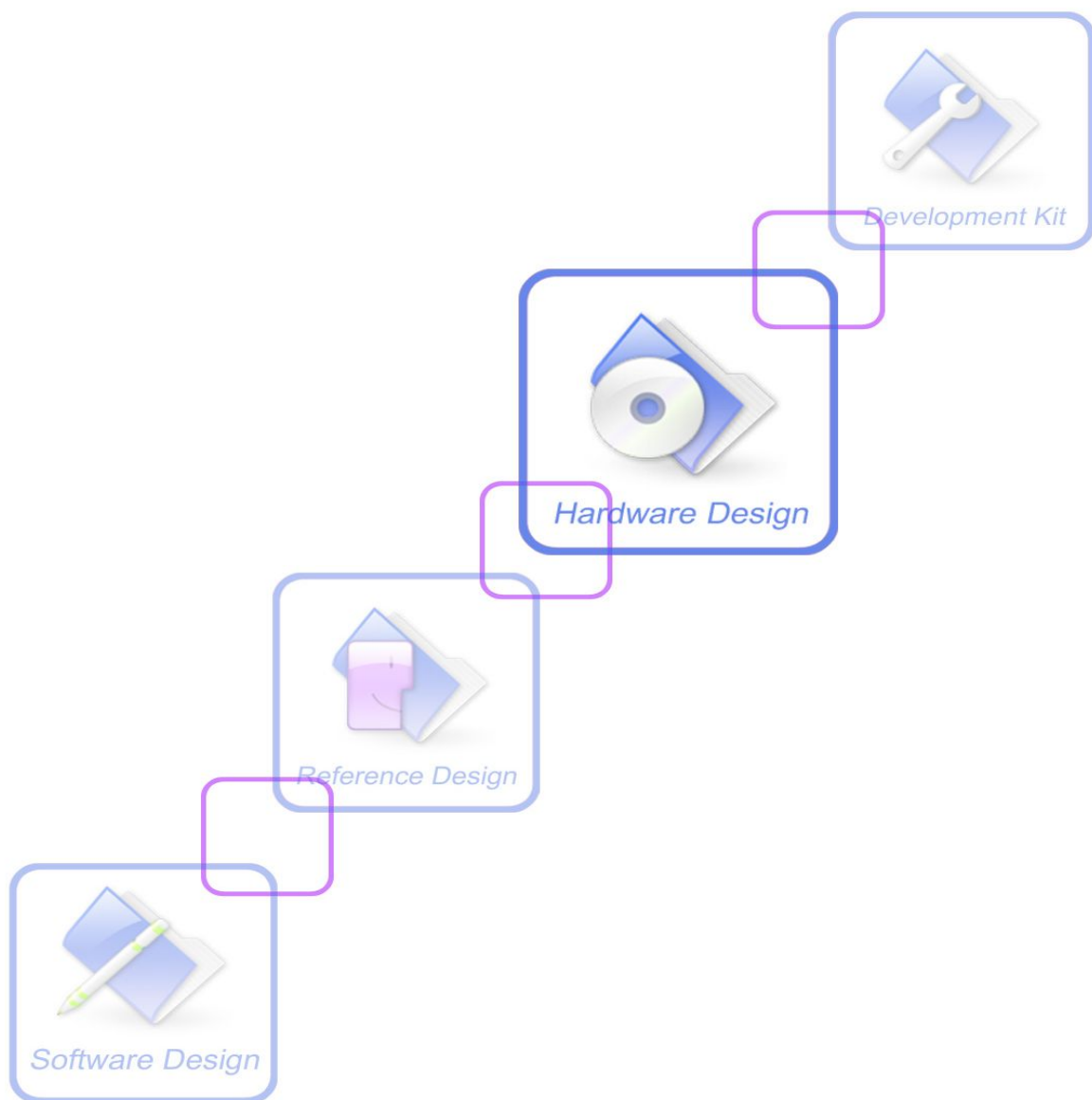




SIM5350-PCIE_ Hardware_Design _V1.03



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Version History

Date	Version	Description of change	Author
2013-08-23	1.00	Origin	Yang Hongliang Wang Yang
2013-11-29	1.01	Add analog audio descriptions; Add SIM card detecting function; Update Mechanical Dimensions and outside view figures; Update chapter 4.3—4.9. Add Reference Schematic	Yang Hongliang
2014-03-28	1.02	Update analog audio descriptions. Delete the descriptions SIM5350XJ-PCIE and SIM5350XA-PCIE series.	Yang Hongliang Zhang Bo
2014-05-31	1.03	Modify PCM voltage level on mini PCI-E connector from 3.3V to 1.8V.	Yang Hongliang

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1. Introduction

SIM5350-PCIE module is PCI Express Mini Card. This document describes SIM5350-PCIE hardware interface in great detail, which can help user to quickly understand SIM5350-PCIE interface specifications, electrical and mechanical details.

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2. SIM5350-PCIE Overview

SIM5350-PCIE 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-PCIE series is described in the following table.

Table 1: SIM5350-PCIE Series Frequency Bands

Standard	Frequency	SIM5350XE-PCIE ⁽¹⁾
GSM	GSM 850MHz	✓
	EGSM 900MHz	✓
	DCS1800MHz	✓
	PCS1900MHz	✓
WCDMA	WCDMA 850MHz	
	WCDMA 900MHz	✓
	WCDMA 1900MHz	
	WCDMA 2100MHz	✓
HSPA+	HSDPA	✓
	HSUPA	✓
	Dual -Cell HSPA+	✓ (SIM5350HE-PCIE)
DRX	Receiver Diversity	✓

(1) SIM5350XE-PCIE: Letter 'X' means 'H', 'M' or 'L'. H version support DC-HSPA+, download speed is up to 42Mbps; M version support HSPA+, download speed is up to 21Mbps; L version support HSPA, download speed is up to 14.4Mbps.

SIM5350-PCIE provides various hardware interfaces via Mini PCI Express card connector.

- Power supply: 3.3V
- USB Interface
- SIM Interface
- PCM Interface /Analog Audio
- W_DISABLE#
- WAKE#
- PERST#
- LED_WWAN#

2.1. SIM5350-PCIE Key Features

Table 2: SIM5350-PCIE Key Features

Feature	Implementation
Power supply	3.3V
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 ● SIM5350-PCIEH series: HSDPA Category 24 - 42.2 Mbps + HSUPA Category 7 - 11.5 Mbps ● SIM5350-PCIEM series: HSDPA Category 14 - 21 Mbps + HSUPA Category 6 - 5.76 Mbps ● SIM5350-PCIEL 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
SIM interface	Support SIM card: 1.8V, 3V
PCM /Analog audio interface	Default: Support PCM master mode .Data length is 16 bits (linear), PCM clock rate is 512KHz. Optional: Support 2.2K Ohms microphone, and 16/32 Ohms receiver.
External antenna	Antenna SMT connector, dual Antenna.
Temperature range	● Normal operation temperature: -40℃ ~ +85℃ ● Storage temperature: -45℃ ~ +90℃
Physical characteristics	Size: 50.95*30*3.5mm Weight: 4.7g

Firmware upgrade	Firmware upgrade over USB interface
------------------	-------------------------------------

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

Multislot definition(GPRS/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 rate (4 slots)		Modulation type
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 rate (4 slots)		Modulation type
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 type
Category 1	1.2Mbps		16QAM,QPSK
Category 2	1.2Mbps		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 type
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

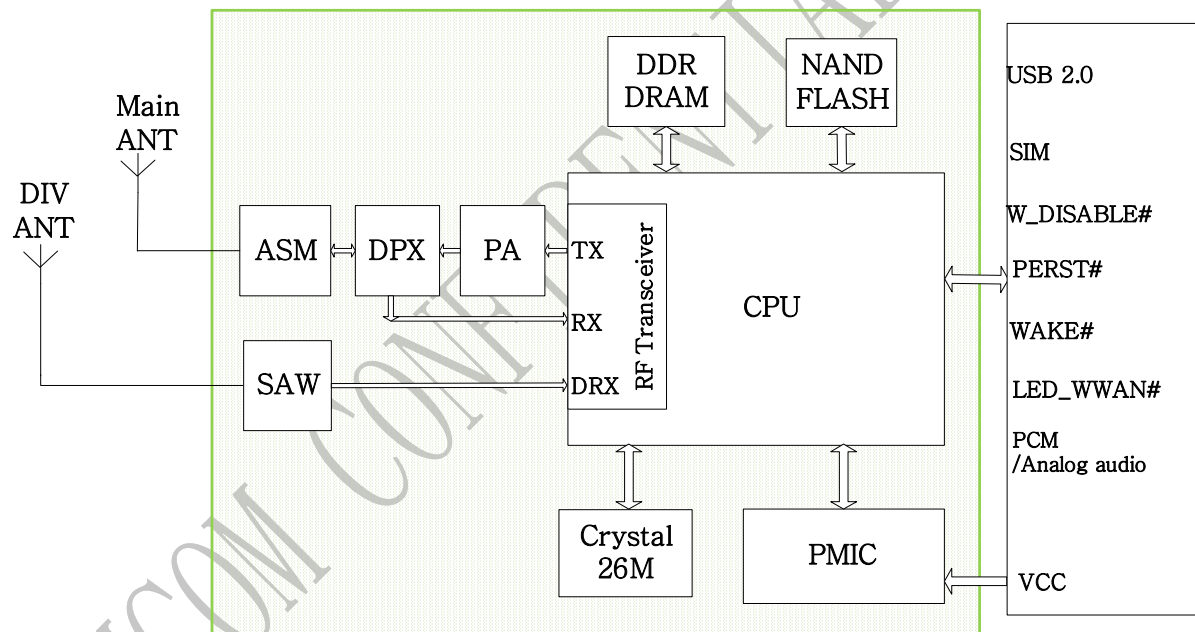
The table below summarizes the various operating modes of SIM5350-PCIE.

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 enabling 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 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, 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-PCIE functional diagram.

Figure 1: SIM5350-PCIE Functional Diagram

3. Package Information

3.1. Pin Out Diagram

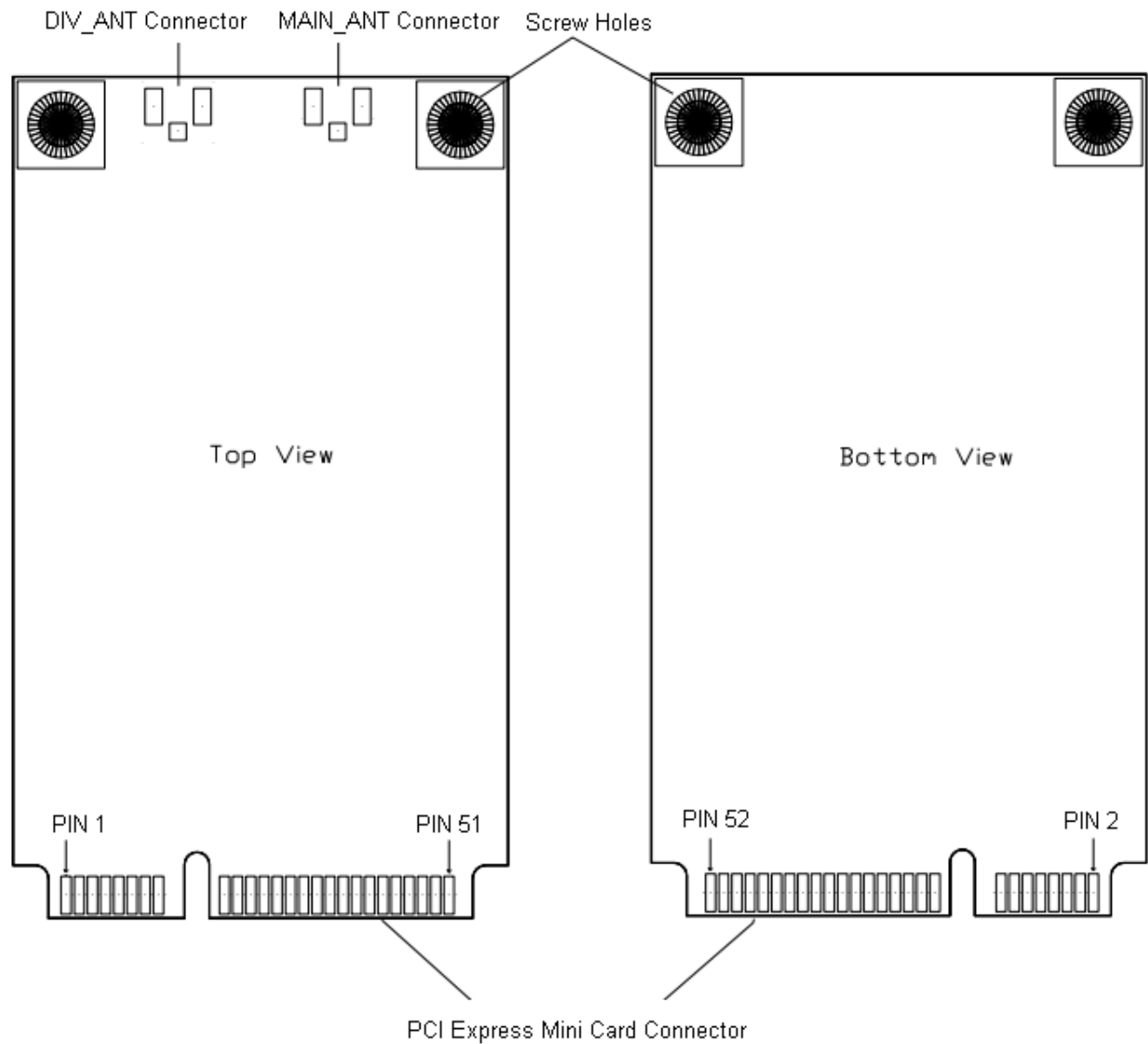


Figure 2: SIM5350-PCIE Pin Out Diagram

3.2. PCI Express Mini Card Connector Pin Description

Table 5: PCI Express Mini Card Connector Pin Description

Pin name	Pin number	I/O	Description	Comment
Power supply				
VCC	2,39,41,52	I	3.3 Power supply for module	
GND	4,9,15,18,21,26,27,29,34,35,37,40,43,50		Ground	
Reset				
PERST#	22	I	Reset input (Active low)	
USB 2.0				
USB_D+	38	I/O	USB 2.0 high speed port for data transfer, voice call, debug and FW download, etc.	
USB_D-	36			
SIM card interface				
UIM_PWR	8	O	1.8/3.0V Configurable LDO output, default 1.8V output, maximum output current is 30mA	
UIM_DATA	10	I/O	SIM data input/output	
UIM_CLK	12	O	SIM clock	
UIM_RESET	14	O	SIM reset	
UIM_DET	16	O	SIM detecting	
PCM interface				
PCM_CLK	45	O	PCM clock	If these pins are unused, keep open
PCM_DOUT	47	O	PCM data output, Internal 4.7K pull-down for system configure	
PCM_DIN	49	I	PCM data input	
PCM_SYNC	51	O	PCM synchrony, Internal 4.7K pull-down for system configure	
others				
EAR_N	7	I	Default: NC Optional: Receiver negative output *	If these pins are unused, keep open
EAR_P	5	I	Default: NC Optional: Receiver positive output *	
MIC_N	3	O	Default: NC Optional: MIC negative input *	
WAKE#/MIC_P	1	I/O	Default: Wake up host Optional: MIC positive input *	
W_DISABLE#	20	I	RF Control Input	

***: If Analog audio is needed, please consult our sales staff for more information .**

Figure 3: Dimensions of SIM5350-PCIE(Unit: mm)

Please refer to appendix for package dimension details.

4. Application Interface

4.1. Power Supply

The recommended power supply voltage of SIM5350-PCIE is 3.3V.

Table 6: Recommended 3.3V Power Supply Characteristics

Symbol	Parameter	Min	Type	Max	Unit
V _O	Power supply voltage	3.2	3.3	3.6	V
I _O	Supply current capability	2000	-	-	mA

4.2. Power Saving Mode

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

4.2.1 Minimum Functionality Mode and Sleep Mode

The AT command “AT+CFUN=<fun>” can be used to set SIM5350-PCIE 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 7: 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-PCIE 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, SIM5350-PCIE will enter sleep mode automatically for reducing power consume, when peripheral equipment of SIM5350-PCIE stops working, and module has no on air or audio activity required. In sleep mode, SIM5350-PCIE can still receive paging or SMS from network.

Note: SIM5350-PCIE could enter sleep mode when the host CPU supports USB suspend mode, otherwise it could not enter sleep mode.

4.2.2 Wake Up SIM5350-PCIE from Sleep Mode

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

- USB HOST sends USB resume request.
- Receive a voice or data call from network.
- Receive a SMS from network.

4.3. USB 2.0

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

4.3.1. USB Port Specification

SIM5350-PCIE 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.

Table 8: USB port Specification

Port Name	Description
USB Application Port	Module could be controlled by sending AT command via 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.

4.3.2. Firmware Update

If users need to upgrade through USB port, it is necessary to power on SIM5350-PCIE 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].

4.4. 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, and support SIM card detecting function.

It is recommended to use an ESD protection component such as ST (www.st.com) ESDA6V1W5. The SIM peripheral circuit including resistors and ESD TVSs should be close to the SIM card socket. The reference circuit of the 8-pin SIM card holder is illustrated in the following figure.

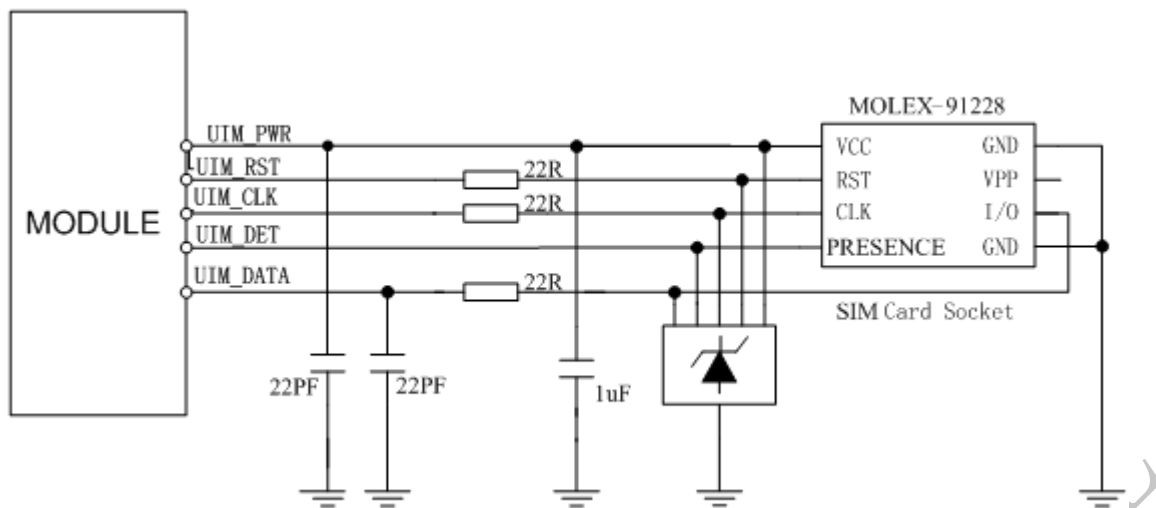


Figure 4: 8 Pin SIM Card Holder Reference Circuit

The UIM_DET pin is used for detection of the SIM card hot plug in. User can select the 8-pin SIM card holder to implement SIM card detection function. AT command “AT+CGFUNC” is used to enable or disable SIM card detection function. For details of this AT command, please refer to *document [1]*.

If the SIM card detection function is not used, user can keep the UIM_DET pin open. The reference circuit of 6-pin SIM card holder is illustrated in the following figure.

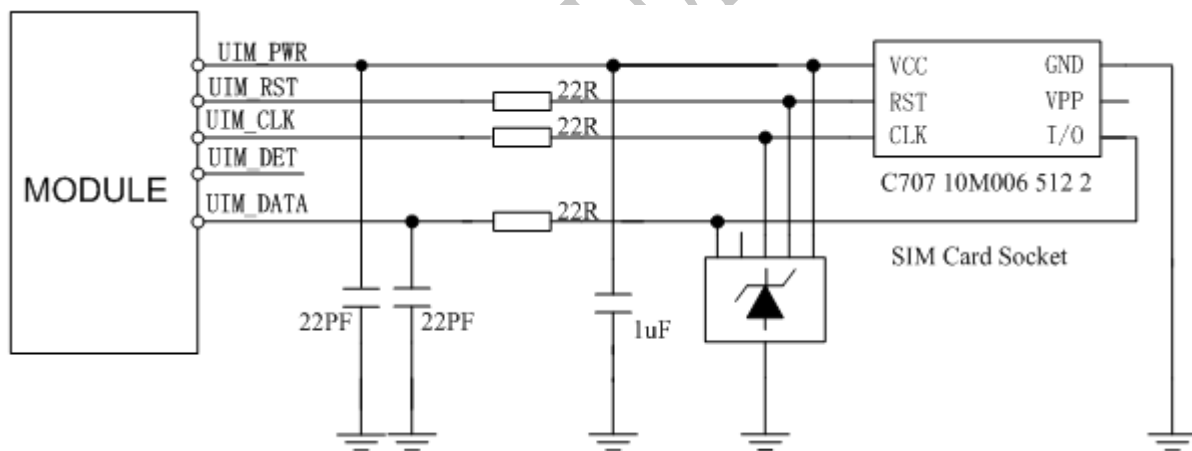


Figure 5: 6 Pin SIM Card Holder Reference Circuit

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 should stay away from GSM antenna while in PCB layout;
- SIM traces should keep away from RF lines、VBAT and high-speed signal lines, and the shorter the better;
- Keep good connectivity between SIM holder GND and module GND;
- It is recommended to do some protection on UIM_CLK to keep away from interference;
- Recommended to place a 1uF capacitor on UIM_PWR line and keep close to the holder;
- Place some TVS, the parasitic capacitance should not exceed 50pF, and cascade 220hm resistor to enhance ESD protection.

4.5. PCM/Analog Audio Interface

SIM5350-PCIE provides PCM interface by default, or an optional analog audio. If analog audio is used, PCM interface can't be used.

4.5.1. PCM Interface

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

Table 9: 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 control by AT command. For more details please refer to document [1]

Table 10: PCM DC Characteristics

Symbol	Parameter	Min	Type	Max	Unit
V _{IH}	High-level input voltage	1.44	1.8	2.1	V
V _{IL}	Low-level input voltage	-0.3	0	0.36	V
V _{OH}	High-level output voltage	1.53	1.8	-	V
V _{OL}	Low-level output voltage	-	0	0.27	V

4.5.2. Analog Audio

SIM5350 provides an optional analog input (MIC_P & MIC_N) for 2.2K microphone and an optional analog output (EAR_P & EAR_N) for 16Ohm or 32Ohm receiver.

In order to improve audio performance, the following reference circuits are recommended. The audio signals have to be layout according to differential signal layout rules as shown in following figures.

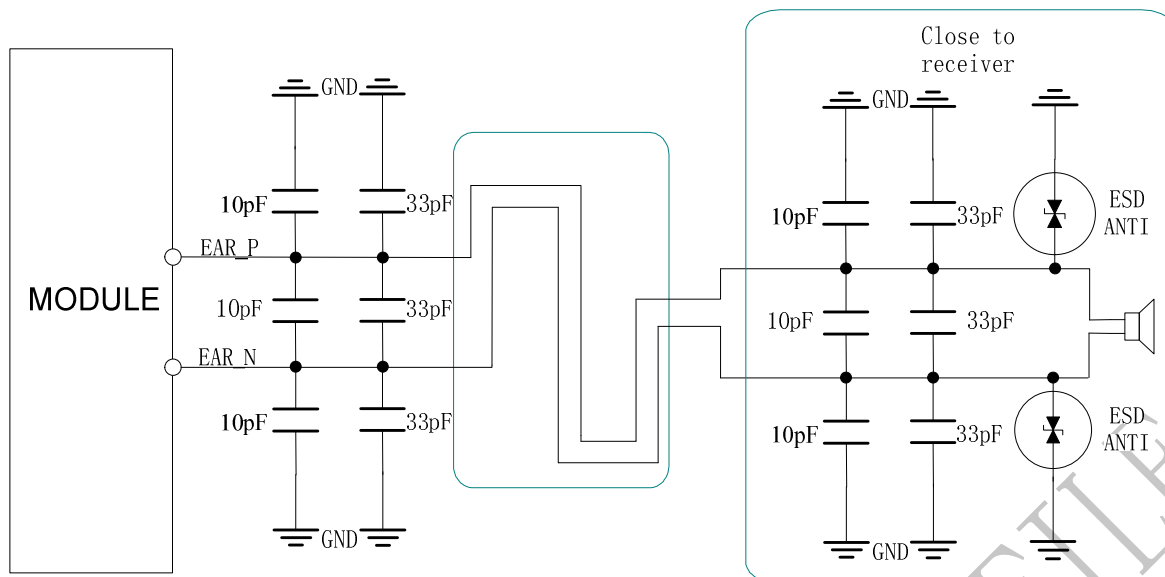


Figure 6: Receiver Reference Circuit

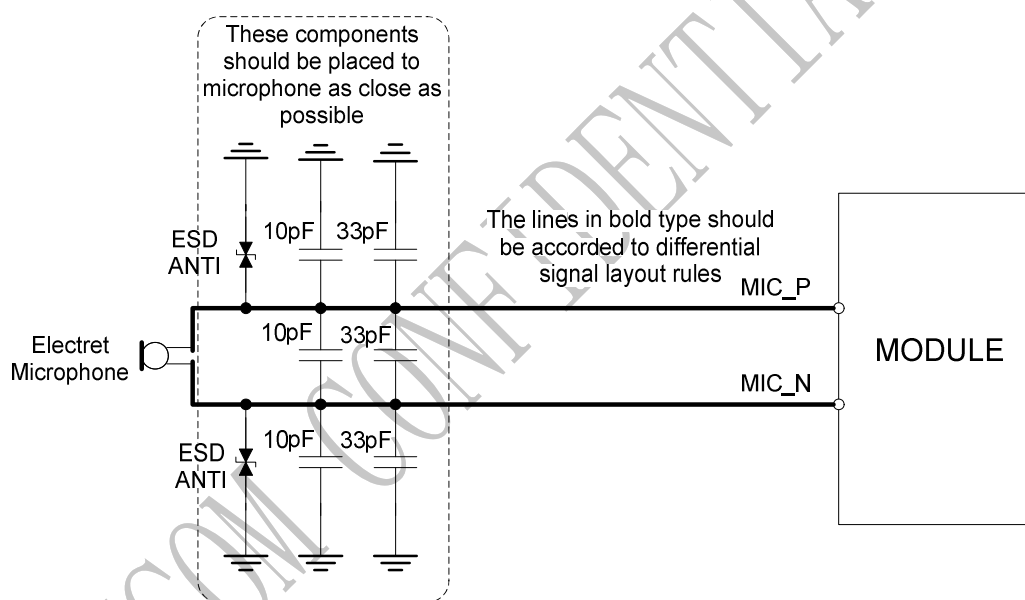


Figure 7: Microphone Reference Circuit

Table 11: Microphone Input Characteristics

Parameter	Min	Type	Max	Unit
MIC biasing voltage	-	2.97	-	V
Working Current	-	-	3	mA
Input impedance(differential)	-	87	-	KΩ

Table 12: Audio Output Characteristics

parameter	Conditions	Min	Type	Max	Unit
Normal output	$R_L=32\text{ Ohm receiver}$	-	10	-	mW
	$R_L=16\text{ Ohm receiver}$	-	40	-	mW

Note: If Analog audio is needed, please consult our sales staff for more information .

4.6. PERST#

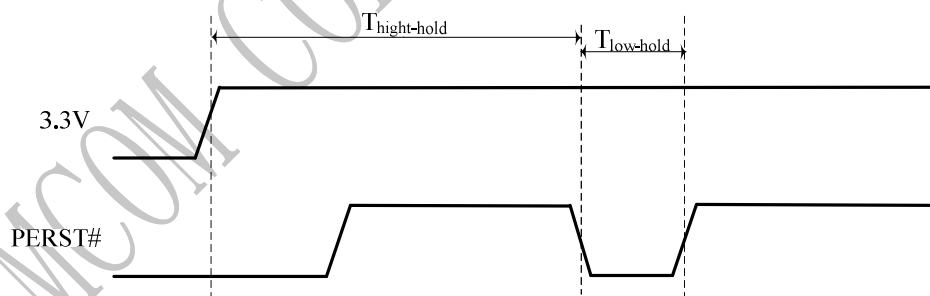
The PERST# pin could be used as an emergency reset. SIM5350-PCIE has power-up reset function, so power-up reset pulse is not necessary. When the PERST# pin is pulled to ground, the module will be reset. The PERST# pin is already pulled up in module, so the external pull-up resistor is not necessary.

The following table is the electrical characteristics of The PERST# pin.

Table 13: PERST# Electrical Characteristic

Symbol	Parameter	Min	Type	Max	Unit
V_{IH}	High-level input voltage	1.7	1.8	3.6	V
V_{IL}	Low-level input voltage	-	-	0.3	V
$T_{\text{high-hold}}$	After power up AND-NOT operation time(keep high level or keep open)	250	-	-	ms
$T_{\text{low-hold}}$	Reset low level hold on time	300	-	-	us

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


Figure 8: Reset Timing

4.7. W_DISABLE#

The W_DISABLE# pin controls SIM5350-PCIE to enter or exit the Flight mode by default. In Flight mode, RF function is closed to prevent interference with other equipments or minimize current consumption.

Table 14: Flight mode control Function

W_DISABLE# status	Module operation
-------------------	------------------

Low Level	Flight Mode: RF is closed.
High Level	Normal Mode: RF is working.

Table 15: W_DISABLE# Electrical Characteristic

Symbol	Parameter	Min	Type	Max	Unit
V _{IH}	High-level input voltage	3.0	3.3	3.6	V
V _{IL}	Low-level input voltage	-	-	0.3	V

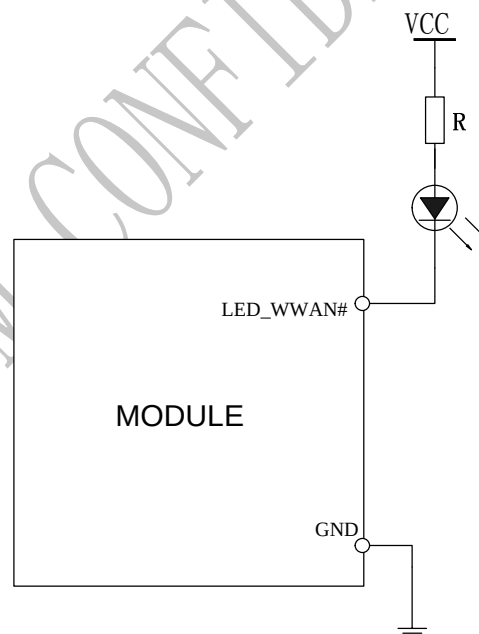
4.8. LED_WWAN#

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

Table 16: Network Status Indication Pin Status

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

Reference circuit is recommended in the following figure:


Figure 9: LED_WWAN# Reference Circuit

4.9. WAKE#

The WAKE# pin 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 WAKE# 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.

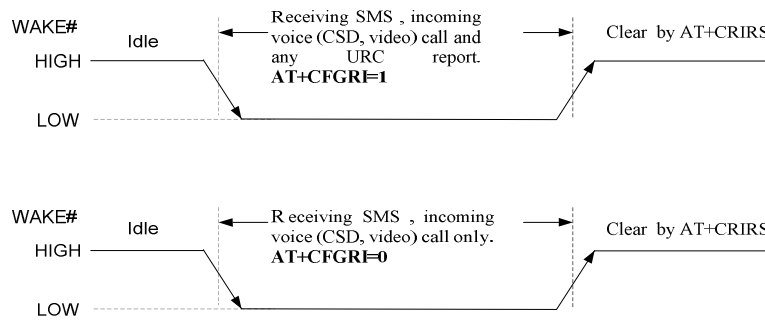


Figure 10: WAKE# behaviour

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

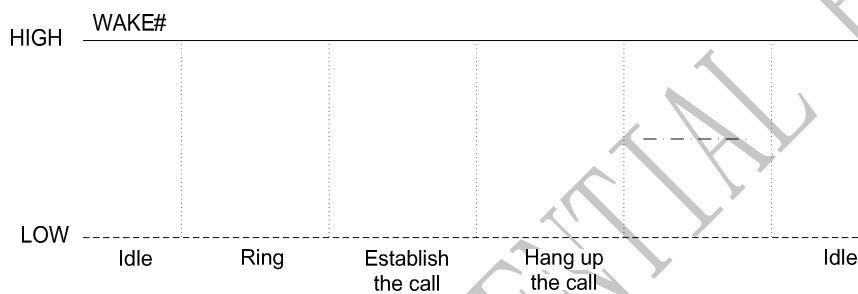


Figure 11: WAKE# behavior as a caller

WAKE# Reference circuit is recommended in the following figure:

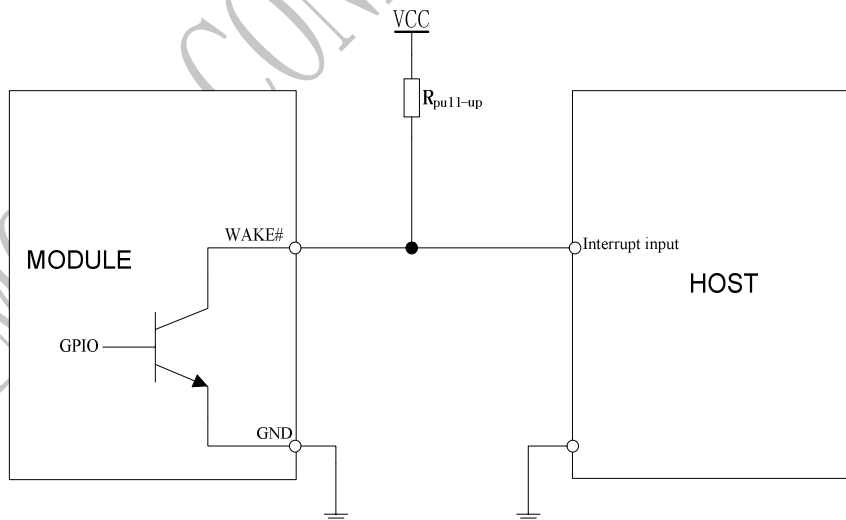


Figure 12: WAKE# Reference Circuit

4.10.SMT Antenna Connector

SIM5350-PCIE have 2 antenna connectors, one of which is the main GSM/WCDMA antenna connector, the other is WCDMA diversity antenna connector. Recommended antenna characteristics of SIM5350-PCIE are described by 2 following tables.

Table 17: Recommended Passive Antenna Characteristics

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

Table 18: 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

5. Electrical, Reliability and Radio Characteristics

5.1. Absolute Maximum Ratings

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

Table 19: Absolute maximum ratings

Symbol	Parameter	Min	Type	Max	Unit
V _{VCC}	VCC input voltage	0	-	3.8	V
I _{VCC}	VCC total peak current	0	-	2.0	A
I _I *	Input current	-	-	8	mA
I _O *	Output current	-	-	8	mA

*Note: * These parameters are for digital interface pins, such as PCM.*

5.2. Recommended Operating Conditions

Please refer to the follow table for recommended operating conditions.

Table 20: Operating Conditions

Symbol	Parameter	Min	Type	Max	Unit
V _{VCC}	3.3V Input voltage	3.2	3.3	3.6	V
T _{OPER}	Operating temperature	-40	+25	+85	°C
T _{STG}	Storage temperature	-45	+25	+90	°C

5.3. SIM Card Interface Characteristics

Table 21: SIM Card Interface Characteristics

Symbol	Parameter	Min	Type	Max	Unit
UIM_RST	V _{OH}	UIM_PWR=1.8V	1.62	-	V
		UIM_PWR=3.0V	2.7	-	V
	V _{OL}	UIM_PWR=1.8V	-	0.36	V
		UIM_PWR=3.0V	-	0.36	V
UIM_CLK	V _{OH}	UIM_PWR=1.8V	1.62	-	V
		UIM_PWR=3.0V	2.7	-	V
	V _{OL}	UIM_PWR=1.8V	-	0.216	V

		UIM_PWR=3.0V	-	-	0.4	V
UIM_DATA	V _{IH}	UIM_PWR=1.8V	1.4	-	-	V
		UIM_PWR=3.0V	2.6	-	-	V
	V _{IL}	UIM_PWR=1.8V	-	-	0.27	V
		UIM_PWR=3.0V	-	-	0.4	V
	V _{OH}	UIM_PWR=1.8V	1.4	-	-	V
		UIM_PWR=3.0V	2.6	-	-	V
	V _{OL}	UIM_PWR=1.8V	-	-	0.27	V
		UIM_PWR=3.0V	-	-	0.4	V

5.4.UIM_PWR Characteristics

Table 22: UIM_PWR 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

5.5.Current Consumption (3.3V)

Table 23: 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.

5.6. Electro-Static Discharge

SIM5350-PCIE 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 24: ESD characteristics (Temperature: 25°C, Humidity: 45 %)

Pin	Contact discharge	Air discharge
VCC	±5KV	±10KV
GND	±5KV	±10KV
Antenna port	±5KV	±10KV
USB_D+,USB_D-	±4KV	±8KV

5.7. Radio Characteristics

5.7.1. Conducted Output Power

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

Table 25: 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

5.7.2. Conducted Receive Sensitivity

The following table shows conducted receiving sensitivity of SIM5350-PCIE.

Table 26: 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 get at static condition.

5.7.3. Supported Band

The following table shows SIM5350-PCIE supported band, and complies with 3GPP spec.

Table 27: 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

6. Appendix

I. SIM5350-PCIE Top and Bottom View

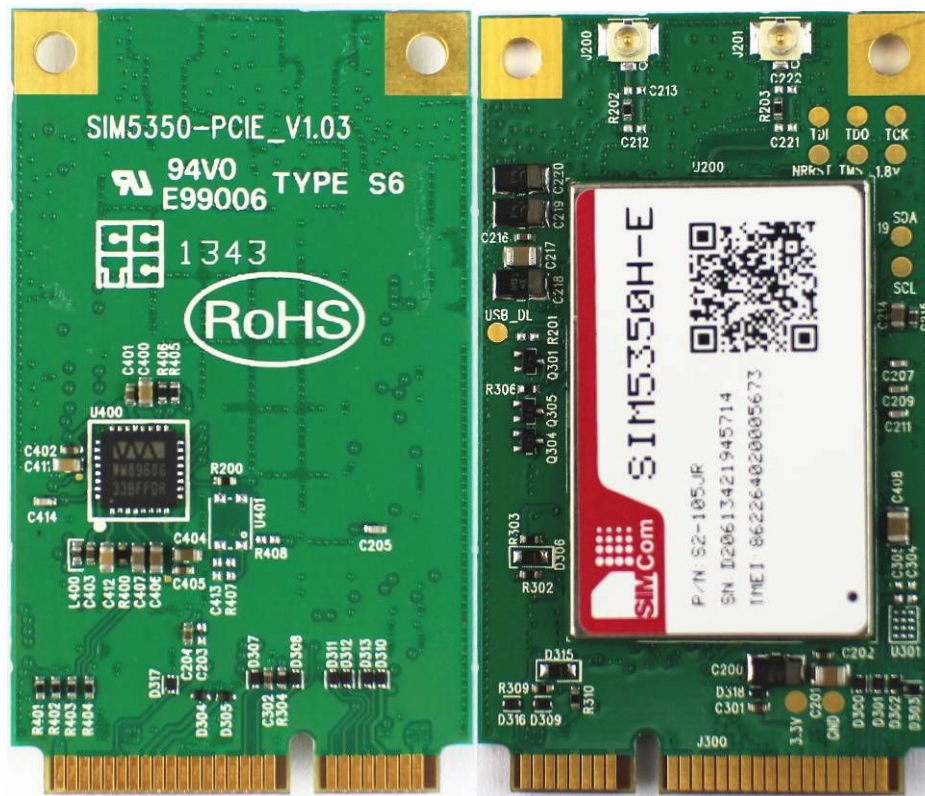


Figure 13: SIM5350-PCIE Top and Bottom View

II. Dimensions of SIM5350-PCIE

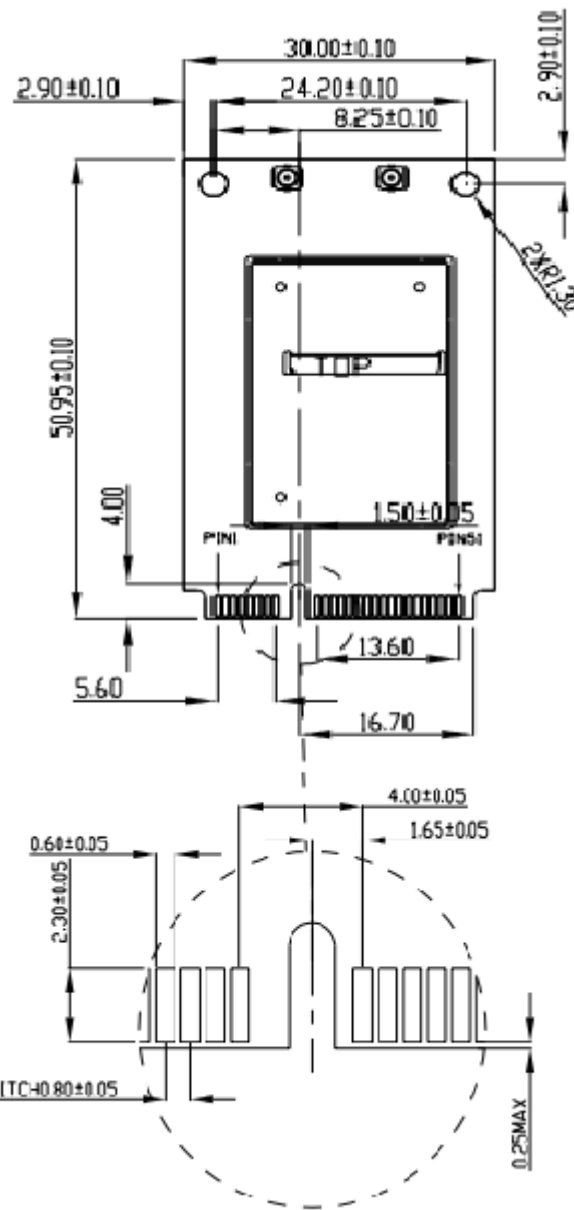


Figure 14: Dimensions of SIM5350-PCIE (Unit: mm Top view)

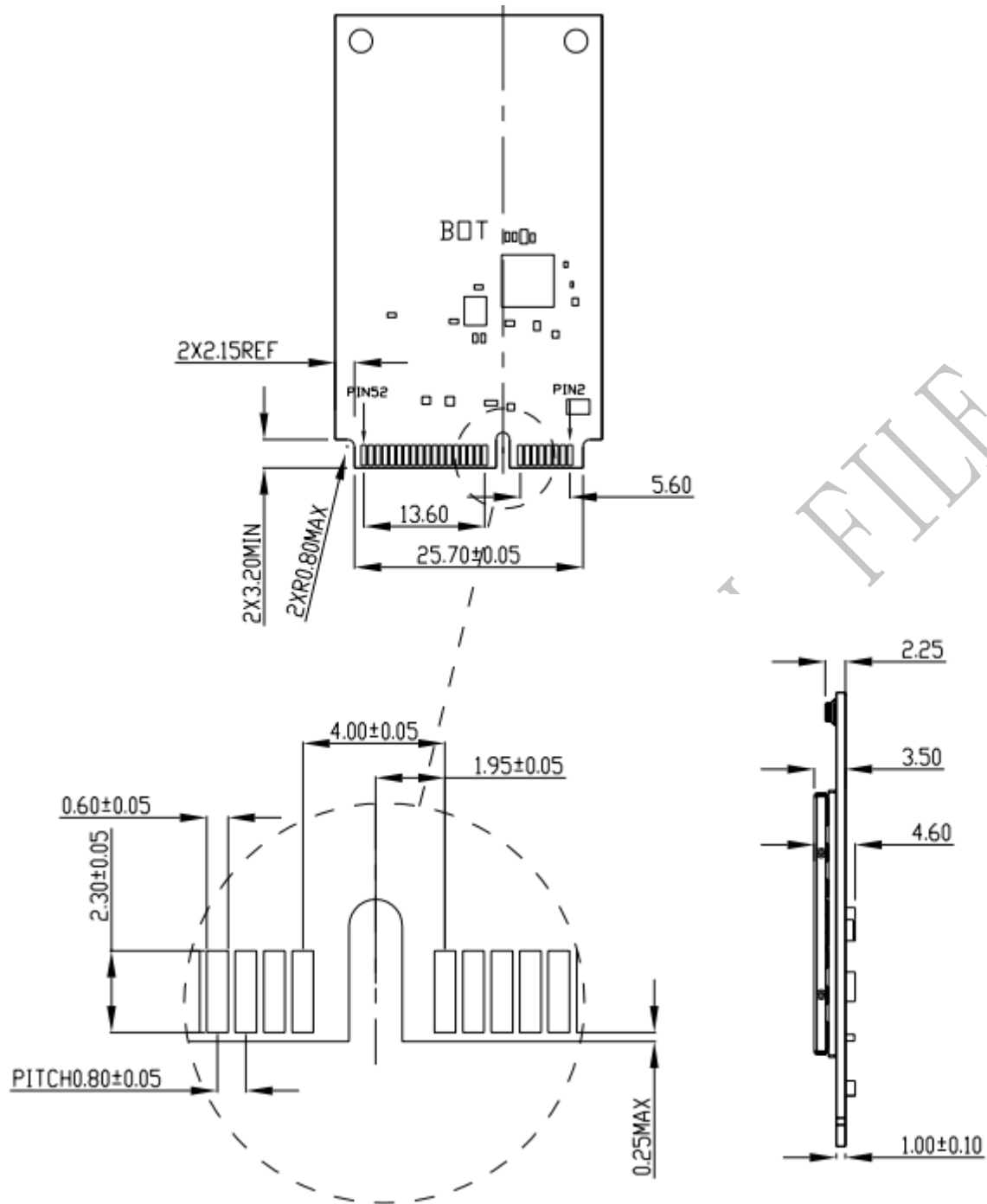
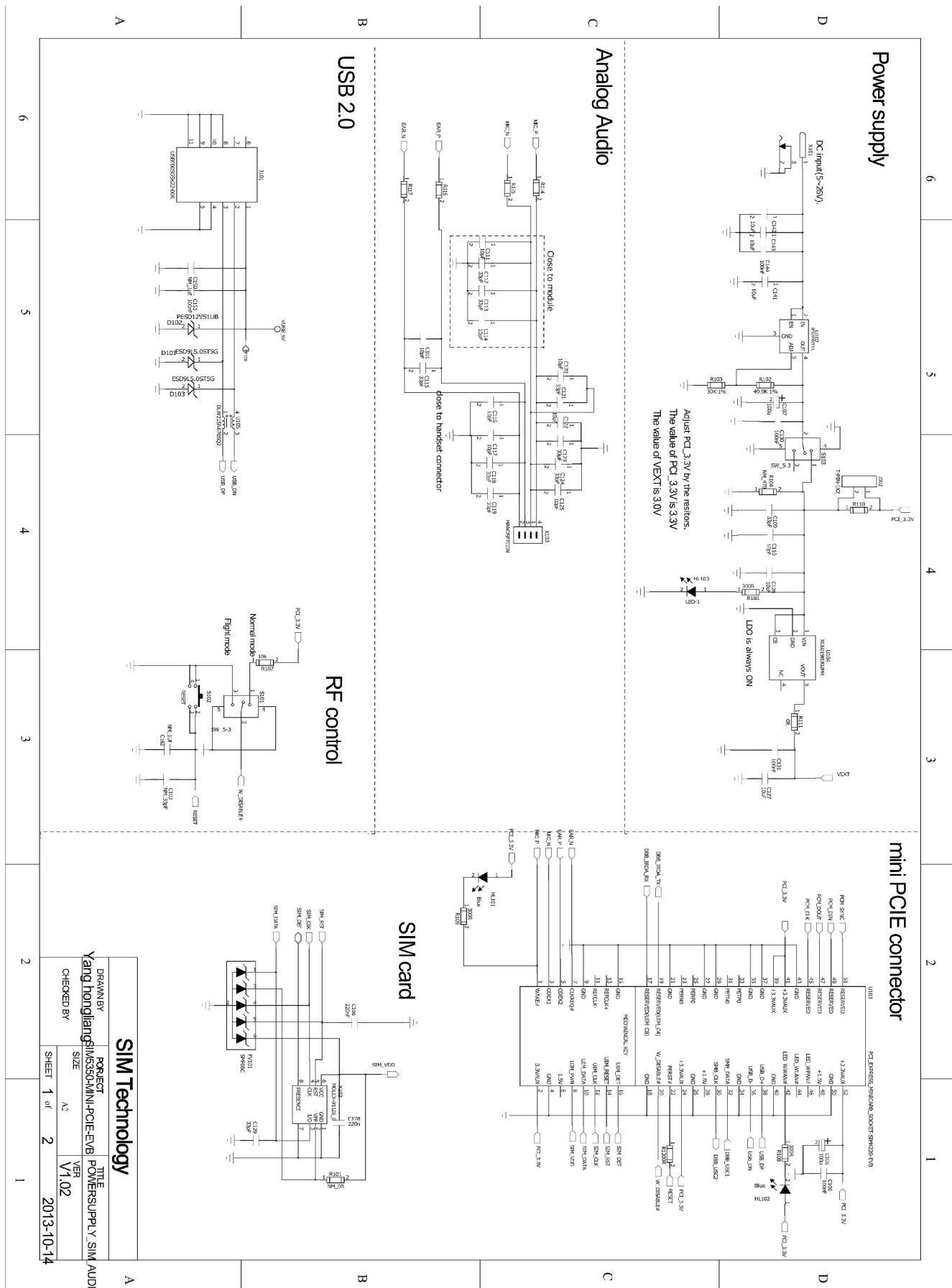


Figure 15: Dimensions of SIM5350-PCIE (Unit: mm Bottom and Side view)

III. Reference Schematic



IV. Related Documents

Table 28: 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

V. Terms and Abbreviations

Table 29: 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

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VI. Safety Caution

Table 30: 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.

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