SIM800C&R800C Compatible Design

2G Module

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1. Introduction

This document is targeted for customers to understand the differences between SIM800C and R800C. Users can use SIM800C or R800C module to design and develop applications quickly.

2. PIN assignment

2.1 Pin Assignment Overview

The following table shows the pin assignment of SIM800C and R800C.

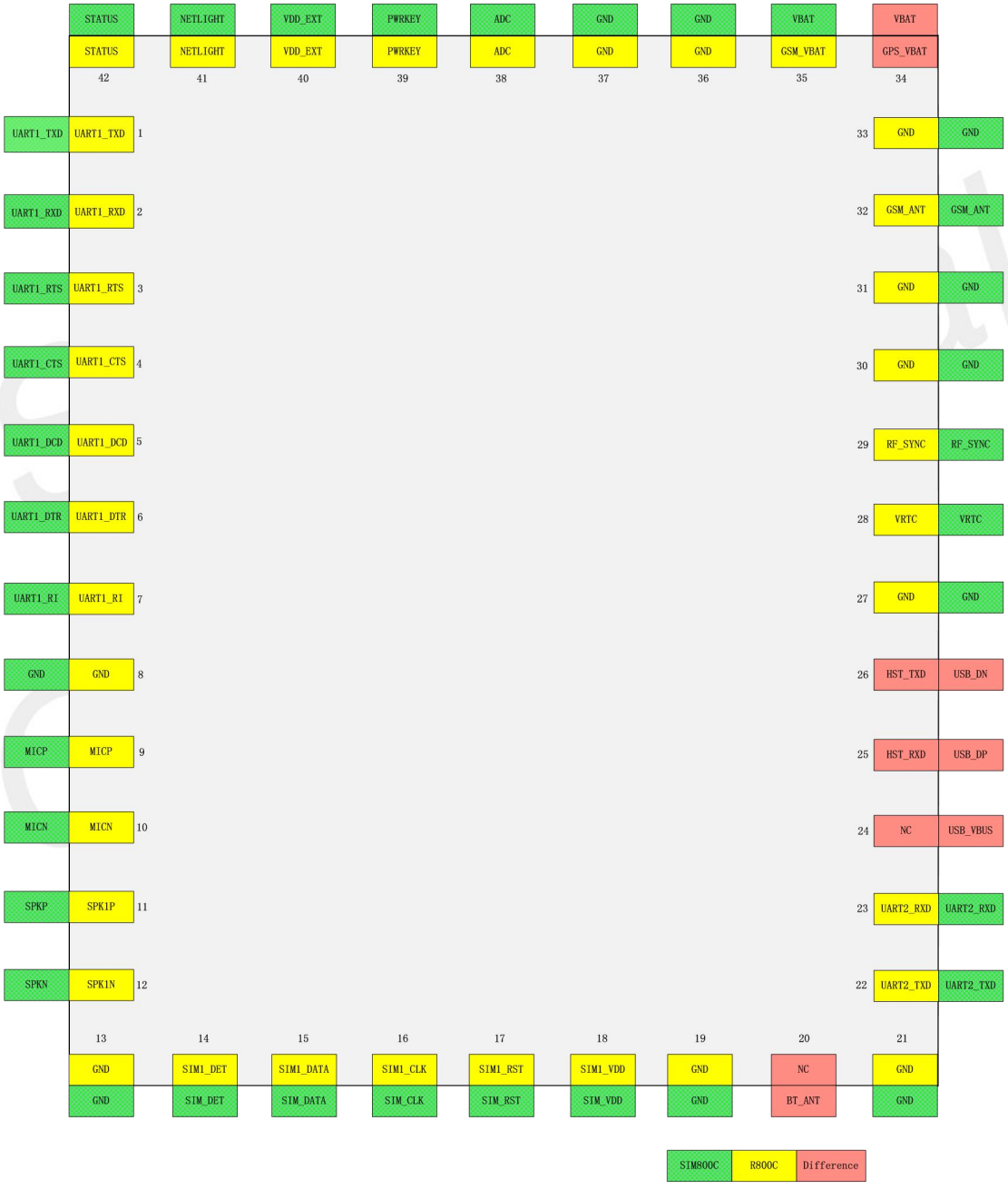

Figure 1: SIM800C and R800C pin assignment (Top view)

2.2 Differences Overview

Table 1: The Differences overview

Functions	SIM800C	R800C
Cellular technology	GSM/GPRS	GSM/GPRS
Bluetooth	Support	Not support
Audio	Support	Support
RESET	Not support	Not support
VRTC	Support	Support
RF_SYNC	Support	Support
Download interface	UART1 or USB	HST_UART
Debug interface	USB	HST_UART
IO Power Domain	2.8V	2.98V

2.3 Differences of Electronic Characteristic

Table 2: The Differences of electronic characteristic

Pin #	SIM800C		R800C	
	PIN name	Voltage range	PIN name	Voltage range
34，35	VBAT	3.4~4.4V	VBAT	3.5~4.2V
1~7	UART1	2.8V	UART1	2.98V
22~23	UART2	2.8V	UART2	2.98V
25~26	USB	\	HST_UART	2.98V
28	VRTC	1.2~3.0V	VRTC	2.99~3.39V
29	RF_SYNC	2.8V	RF_SYNC	2.98V
38	ADC	0~2.8V	ADC	0~1.85V
39	PWRKEY	VBAT	PWRKEY	2.6V
40	VDD_EXT	2.8V	VDD_EXT	2.98V
41	NETLIGHT	2.8V	NETLIGHT	2.98V
42	STATUS	2.8V	STATUS	2.98V

NOTE

**Note: For details information, please refer to each HD guide*

Table 3: Difference in Pin Definitions

Pin #	SIM800C	R800C
20	BT_ANT	NC
24	USB_VBUS	NC
25	USB_DP	HST_RXD
26	USB_DN	HST_TXD

3. Recommended Footprint

3.1 Top and Bottom View

The following figures show top and bottom view of R800Cand SIM800C.
There has no difference for footprint.

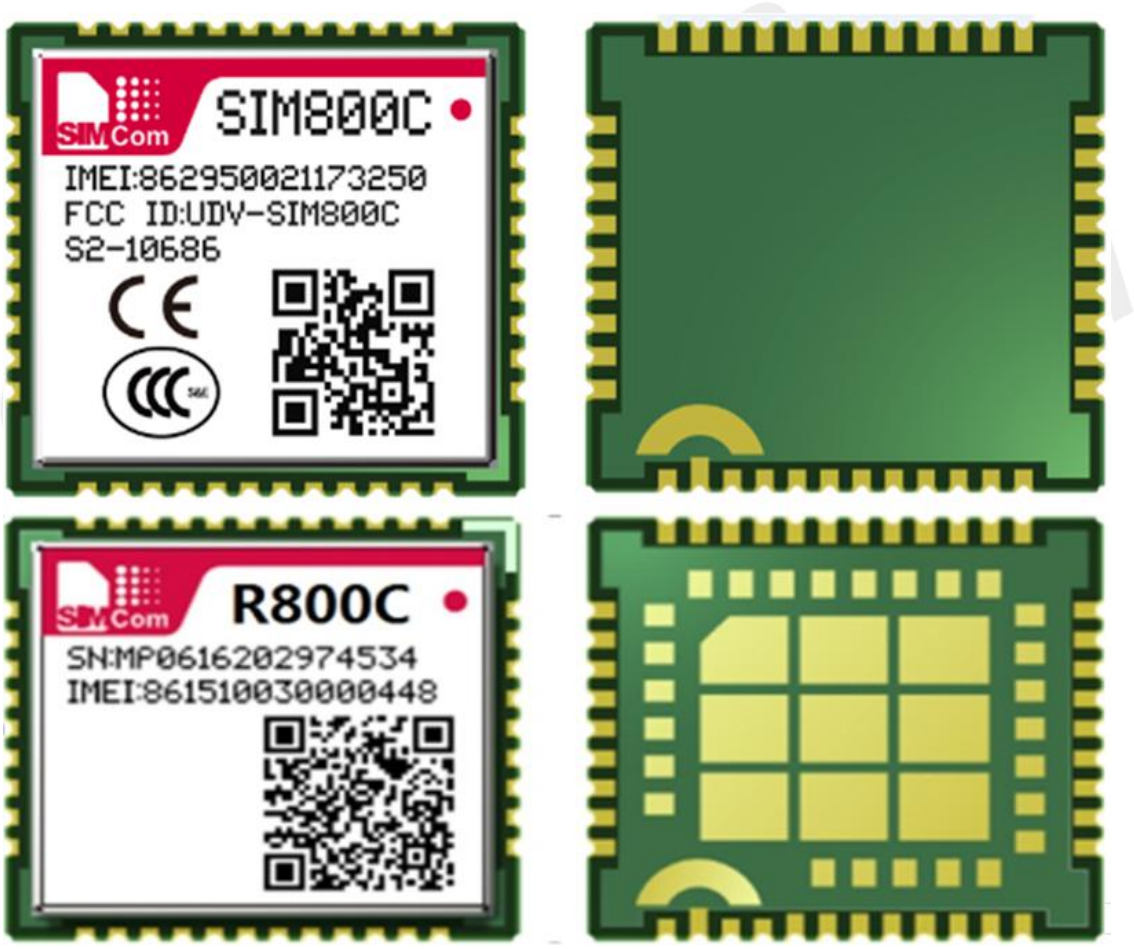

Figure2: SIM800C and R800C top and bottom view

3.2 Recommended Stencil Design

SIM800C and R800C have the same Recommended Stencil Design.

The recommended stencil design for SIM800C and R800C is shown as below.

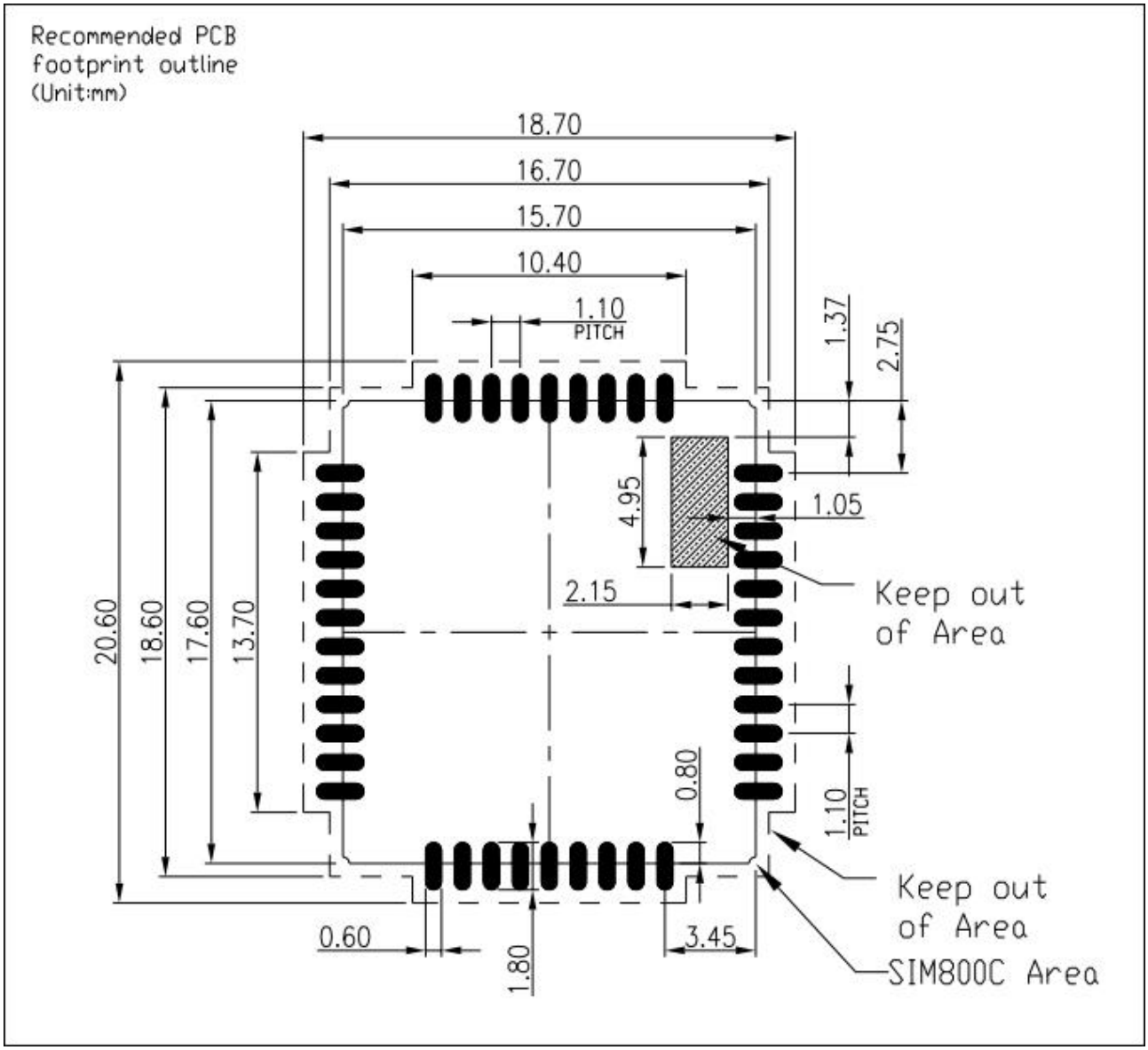

Figure 3: Recommended Stencil Design for SIM800C and R800C (Unit: mm)

4. Hardware Reference Design

This chapter introduces compatible design between SIM800C and R800C on main functionalities.

4.1 Power Supply

The power supply pins of SIM800C and R800C include two VBAT pins (pin 34 and pin 35). VBAT pins directly supply the power to RF circuit and baseband circuit. Both VBAT pins of the module could be used together. The following figure is the reference design of the module VBAT power supply.

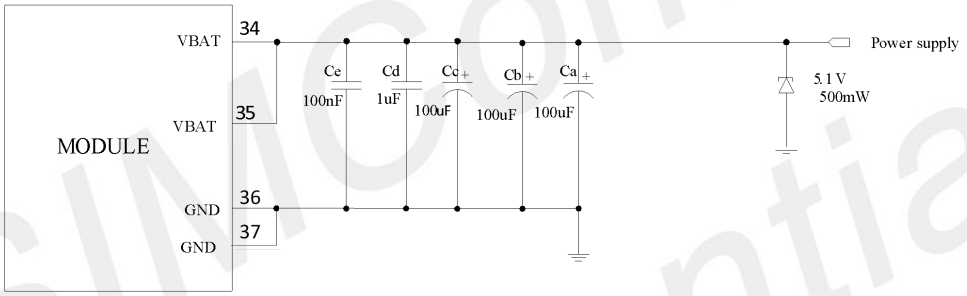

Figure 4: Power supply reference circuit

Table 4: The VBAT power range

Module	VBATpower supply			VBAT power peak current
	Min.	Typical	Max.	Max
SIM800C	3.4V	3.8V	4.4V	2000mA
R800C	3.5V	3.8V	4.2V	2000mA

Power design for a module is critical to its performance. The power supply of SIM800C and R800C should be able to provide sufficient current up to 2.0A.

NOTE

*Note: For details information, please refer to each HD guide

4.2 USB Interface

SIM800C provides a USB interface.
The following circuit is the reference design of USB interface.

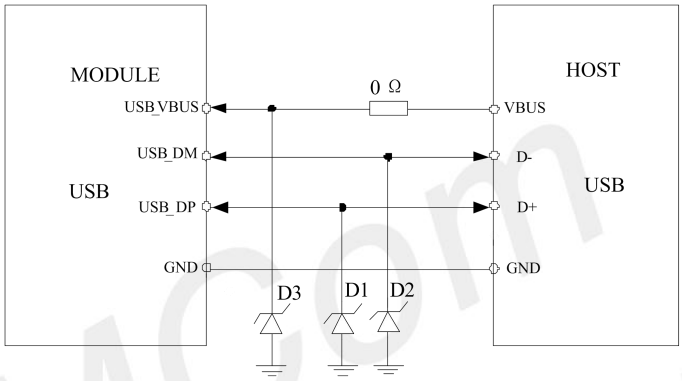

Figure 5: USB reference circuit

4.3 Network Status Indication

The NETLIGHT/STATUS pins can be used to drive a network status indicator LED. The following circuit is the reference design.

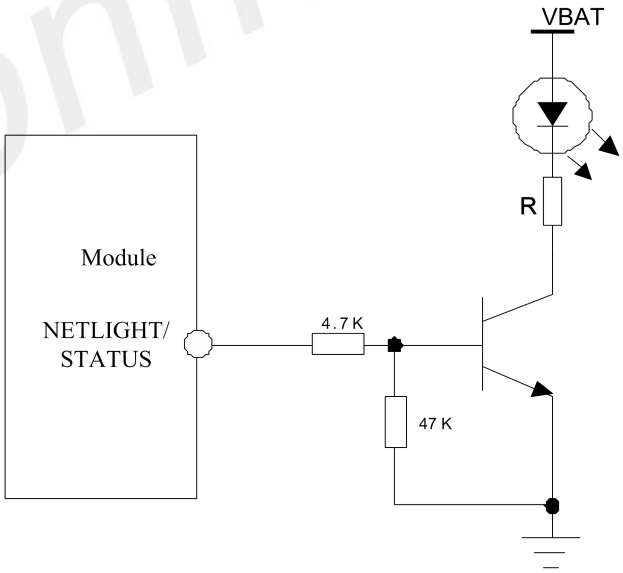

Figure 6: NETLIGHT/STATUS reference circuit

4.4 Power on/off circuit

SIM800C and R800C can be turned on by driving the PWRKEY pin to a low level for a certain time. It is recommended use an open drain or collector driver to control the PWRKEY. A reference circuit is shown below.

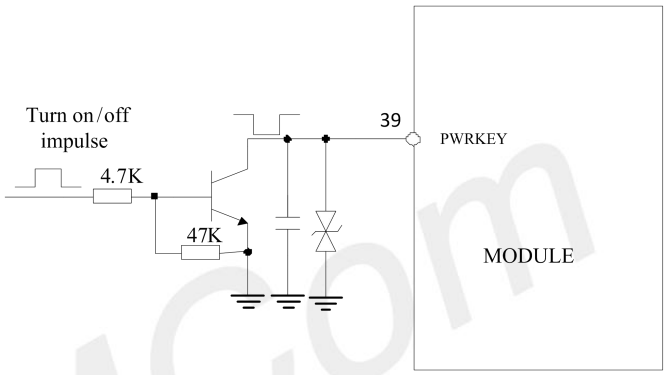

Figure 7: Power on/off reference circuit

Table 5: PWRKEY timing and electronic characteristic

Revision	PWRKEY pinvoltage When floating	PWRKEY input effective low level voltage For turn on	PWRKEY input low level minimum time For turn on	PWRKEY input low level minimum time For turn off
SIM800C	3V	<0.7V	>1000ms	>1500ms
R800C	2.6	<0.78V	>1600ms	>800ms©

4.5 USIM Interface

Both 1.8V and 3.0V USIM cards are supported on both modules.
The following circuit is a reference design for R800C and SIM800C USIM circuit.
The pin assignment of SIM800C USIM interface and R800C USIM interface are compatible with each other.
A compatible design for 6-pin USIM interface is shown in the figure below:

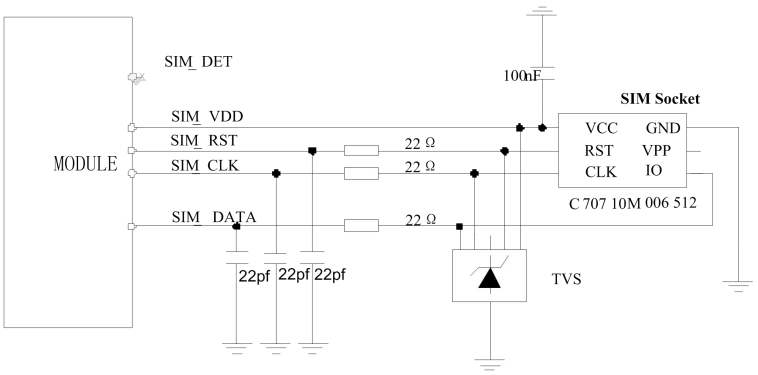

Figure 8: SIM interface reference circuit

NOTE

*Note: For details information, please refer to each HD guide

4.6 UART Interface

The module is as the DCE (Data Communication Equipment) and the client PC is as the DTE (Data Terminal Equipment). AT commands are executed through UART interface.

SIM800C UART1 is used for AT command communication, and firmware upgrade. SIM800C UART2 is only used for debug.

R800C UART1 and UART2 is used for AT command communication. And HST_UART is used for both RF calibrate and FW upgrade.

Below are the reference circuits.

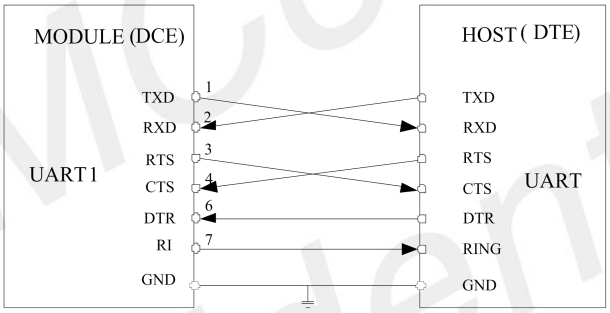

Figure 9: UART Full modem

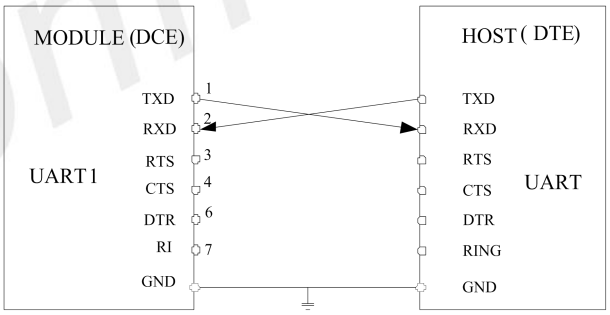

Figure 10: UART Null modem

A level shifter should be used if external host UART interface is 3.3V level. The voltage-level translator TXB0108RGYR provided by Texas Instruments is recommended. The reference design of the TXB0108RGYR is in the following figures.

NOTE

*Note: For details information, please refer to each HD guide

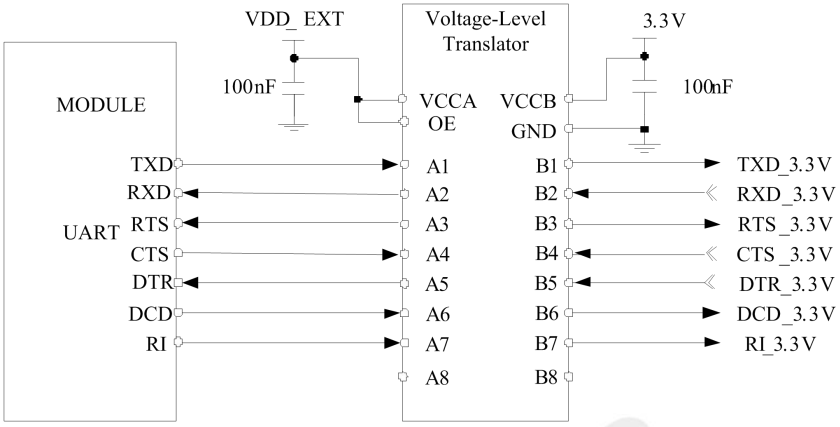

Figure 11: Reference circuit of voltage-level translator

NOTE

*Note: The VDD_EXT of each project in the diagram is different.For details information, please refer to each HD guide.

4.7 RF Interface

R800C or SIM800C provide acellular antenna interface.

External antenna should be placed close to module RF pad through micro-strip line or other types of RF trace, and the trace impedance must be controlled as 50Ω.

The following circuit is a reference design for SIM800C and R800C RF antenna circuit.

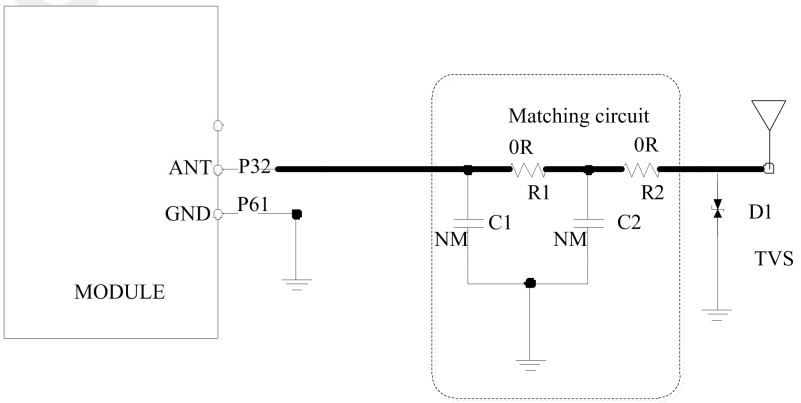

Figure 12: Antenna matching circuit

The capacitors (C1/C2) are not mounted and a 0Ω resistor is mounted on R1 and R2 by default. The component D1 is a TVS for ESD protection, and it is optional for users according to application environment.

The RF test connector is used for the conducted RF performance test, and should be placed as close as to the module's RF_ANT pin. Two TVS are recommended in the table below.

Table 6: Recommended TVS

Package	Part Number	Vender
0201	LXES03AAA1-154	Murata
0402	LXES15AAA1-153	Murata

4.8 GPIO Interface

There are some dedicated GPIO pins for SIM800C and R800C.

Table 7: Dedicated Pins Description for module

	SIM800C	R800C
GPIO voltage domain	2.8V	2.98V
VDD_EXT	2.8V	2.98V

The following circuit is the reference design.

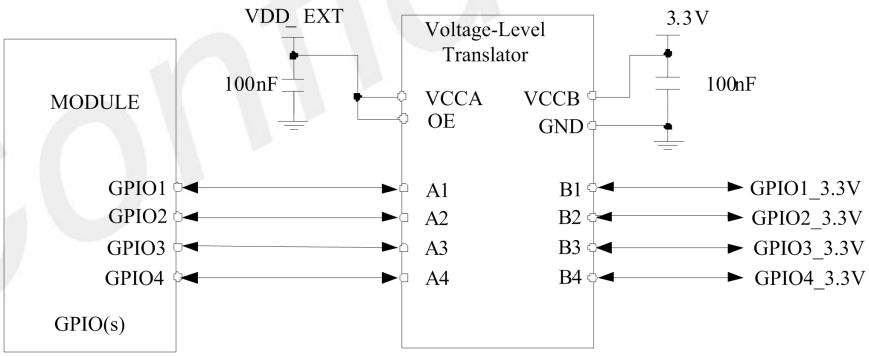

Figure 13: Reference circuit of GPIO voltage-level translator

4.9 Audio interface

The module provides a channel of analog audio input (MICP, MICN) that can be used to connect a microphone (electret microphone is recommended). The module also provides one analog audio output (SPK1P/1N), the audio pin definition is shown in Table 8.

Table 8: Dedicated Pins Description for module

Name	Pin number	Function
MICP	9	Audio input positive
MICN	10	Audio input negative
SPK1P	11	Audio output positive
SPK1N	12	Audio output negative

4.9.1 Receiver interface circuit

It is recommended that users choose the following circuit according to the actual application to get a better sound effect. Note that the audio signal line is a differential signal, which needs to be fully considered when laying out the PCB.

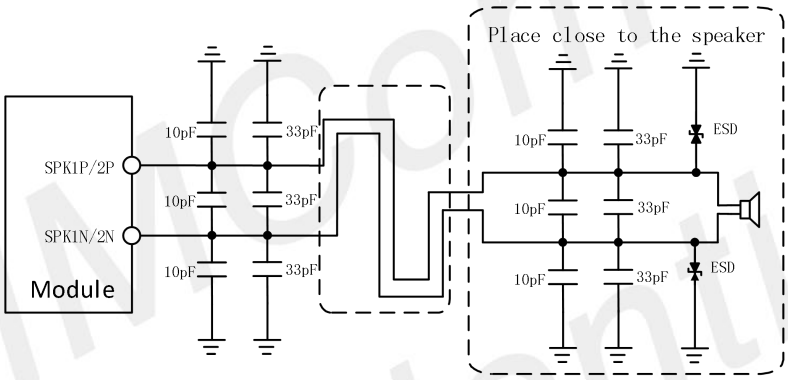

Figure 14: Receiver interface circuit

4.9.2 Microphone interface circuit

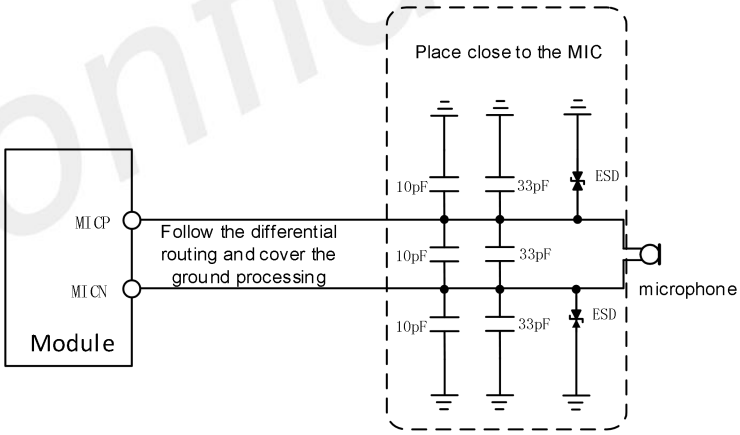

Figure 15: Microphone interface circuit

4.9.3 Audio TDD

Module signals can interfere with audio through coupling and conduction. Users can add 33pF and 10pF capacitors to the audio path to filter out coupling interference. The 33pF capacitor mainly filters out the interference in the GSM850/EGSM900 frequency band, and the 10pF capacitor mainly filters out the interference in the DCS1800/PCS1900 frequency band. The coupling interference of TDD has a lot to do

with the user's PCB design. In some cases, TDD in the GSM850/EGSM900 frequency band is more serious, and in some cases, the TDD interference in the DCS1800/PCS1900 frequency band is more serious. Therefore, the user can select the required filter capacitor according to the actual test results, and sometimes there is no need to paste the filter capacitor.

The module antenna is the main source of coupling interference for TDD, so the user should pay attention to keeping the audio trace away from the module antenna and VBAT during PCB layout and wiring. It is best to place a set of audio filter capacitors close to the module end and another set close to the interface end. The audio output should be routed in accordance with the differential signal rules.

The conduction interference is mainly caused by the voltage drop of VBAT. If Audio PA is directly powered by VBAT, it is easier to hear a "squeak" sound at the output of SPK. Therefore, it is best to connect the input of Audio PA in parallel when designing the schematic. Some large value capacitors and series magnetic beads.

TDD and GND are also closely related. If the GND is not handled well, many high-frequency interference signals will interfere with the MIC and Speaker through bypass capacitors and other components. Therefore, the user must ensure good GND performance during the PCB design stage.

4.10 ADC Interface

SIM800C and R800C modules provide a 10-bit ADC input channel to read the external voltage value.
They have different sampling scope.

Table 10: Module ADC Interface Information

interface	SIM800C	R800C
ADC	0~2.8V	0~1.85V

5. Appendix

5.1 Related Documents

Table 11: Related documents

SN	Document name	Remark
[1]	R800C_Hardware_Design	R800C Hardware Design Document
[2]	SIM800C_Hardware_Design	SIM800C Hardware Design Document

5.2 Terms and Abbreviation

Table 12: Terms and Abbreviations

Abbreviation	Description
ESD	Electrostatic Discharge
GSM	Global Standard for Mobile Communications
PCB	Printed Circuit Board
PCS	Personal Communication System, also referred to as GSM 1900
RF	Radio Frequency
RTC	Real Time Clock
Rx	Receive Direction
SIM	Subscriber Identification Module
UART	Universal Asynchronous Receiver & Transmitter
NC	Not connect
EDGE	Enhanced data rates for GSM evolution
HSDPA	High Speed Downlink Packet Access HSUPA
HSDPA	High Speed Downlink Packet Access HSUPA
HSDPA	High Speed Downlink Packet Access HSUPA
USIM	Universal subscriber identity module
UMTS	Universal mobile telecommunications system
SMPS	Switch Mode Power Supply