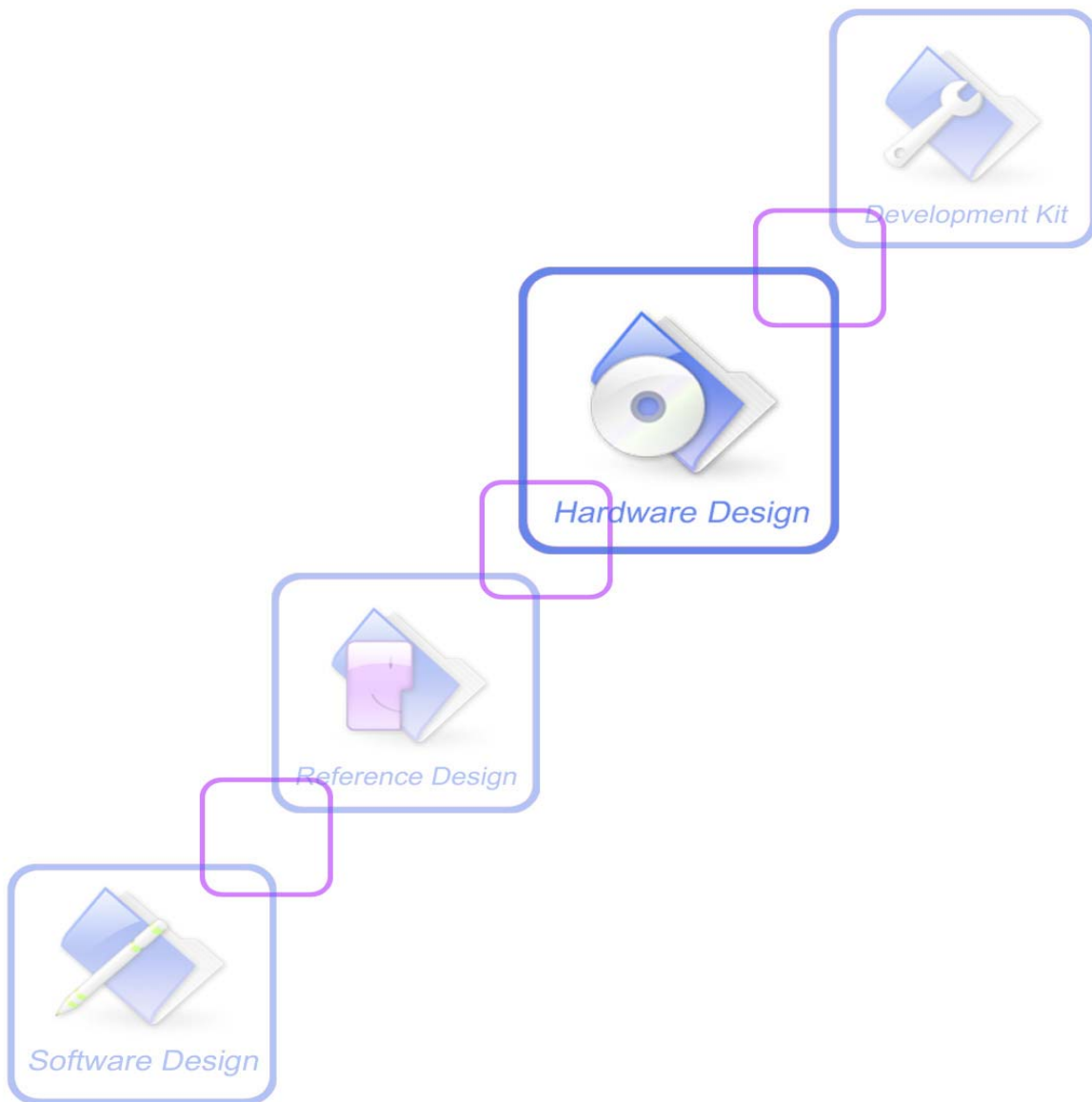




A company of SIM Tech

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1 Introduction

This document describes SIM800E hardware interface in great detail.

This document can help user to quickly understand SIM800E interface specifications, electrical and mechanical details. With the help of this document and other SIM800E application notes, user guide, users can use SIM800E to design various applications quickly.

2 SIM800E Overview

Designed for global market, SIM800E is a Dual-band GSM/GPRS module that works on frequencies EGSM 900MHz, DCS 1800MHz. SIM800E features GPRS multi-slot class 12 and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

With a tiny configuration of 21*24*3mm, SIM800E can meet almost all the space requirements in user applications, such as M2M, smart phone, PDA and other mobile devices.

SIM800E has 24 SMT pads, and provides all hardware interfaces between the module and customers' boards.

- Serial port and debug port can help user easily develop user's applications.
- Programmable general purpose input and output.
- The SIM interfaces

SIM800E is designed with power saving technique so that the current consumption is as low as 1.0mA in sleep mode.

SIM800E integrates TCP/IP, PPP and UDP protocol and extended TCP/IP AT commands which are very useful for data transfer applications.

2.1 SIM800E Key Features

Table 1: SIM800E key features

Feature	Implementation
Power supply	3.4V ~ 4.5V
Power saving	Typical power consumption in sleep mode is 1mA (BS-PA-MFRMS=5)
Frequency bands	<ul style="list-style-type: none"> ● SIM800E Dual-band: EGSM 900, DCS 1800, SIM800E can search the 2 frequency bands automatically. The frequency bands also can be set by AT command "AT+CBAND". For details, please refer to <i>document [1]</i>. ● Compliant to GSM Phase 2/2+
Transmitting power	<ul style="list-style-type: none"> ● Class 4 (2W) at EGSM 900 ● Class 1 (1W) at DCS 1800
GPRS connectivity	<ul style="list-style-type: none"> ● GPRS multi-slot class 12 (default) ● GPRS multi-slot class1~12 (option)

	<ul style="list-style-type: none"> ● GPRS mobile station class B
Temperature range	<ul style="list-style-type: none"> ● Normal operation: -30°C ~ +80°C ● Restricted operation: -40°C ~ -30°C and +80 °C ~ +85°C* ● Storage temperature -45°C ~ +90°C
Data GPRS	<ul style="list-style-type: none"> ● GPRS data downlink transfer: max. 85.6 kbps ● GPRS data uplink transfer: max. 85.6 kbps ● Coding scheme: CS-1, CS-2, CS-3 and CS-4 ● Integrate the TCP/IP, UDP, PPP protocol. ● Support the protocol PAP usually used for PPP connections
CSD	<ul style="list-style-type: none"> ● Support CSD transmission ● CSD transmission rates:2.4,4.8,9.6,14.4kbps non-transparent
USSD	<ul style="list-style-type: none"> ● Unstructured Supplementary Services Data (USSD) support
SMS	<ul style="list-style-type: none"> ● MT, MO, CB, Text and PDU mode ● SMS storage: SIM card
FAX	Group 3 Class 1
SIM interface	Support SIM card: 1.8V, 3V
External antenna	Antenna pad
Serial port and debug port	<p>Serial port:</p> <ul style="list-style-type: none"> ● 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. ● Multiplex ability according to GSM 07.10 Multiplexer Protocol. ● Autobauding supports baud rate from 1200 bps to 115200bps. ● Firmware upgrade <p>Debug port:</p> <ul style="list-style-type: none"> ● Null modem interface DBG_TXD and DBG_RXD. ● Can be used for debugging software.
Real time clock	Support RTC
Physical characteristics	Size: 21*24*3mm Weight: 4g
Firmware upgrade	Firmware upgradeable by serial port.

*SIM800E does work at this temperature, but some radio frequency characteristics may deviate from the GSM specification.

Table 2: Coding schemes and maximum net data rates over air interface

Coding scheme	1 timeslot	2 timeslot	4 timeslot
CS-1	9.05kbps	18.1kbps	36.2kbps
CS-2	13.4kbps	26.8kbps	53.6kbps
CS-3	15.6kbps	31.2kbps	62.4kbps
CS-4	21.4kbps	42.8kbps	85.6kbps

2.2 Operating Modes

The table below summarizes the various operating modes of SIM800E.

Table 3: Overview of operating modes

Mode	Function
Normal operation	GPRS 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.
	GPRS STANDBY Module is ready for GPRS data transfer, but no data is currently sent or received. In this case, power consumption depends on network settings and GPRS configuration.
	GPRS DATA There is GPRS data transfer (PPP or TCP or UDP) 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).
Power down	Normal power down by sending the AT command “AT+CPOWD=1” or using the PWRKEY. The power management unit shuts down the power supply for the baseband part of the module, and only the power supply for the RTC is remained. Software is not active. The serial port is not accessible. Power supply (connected to VBAT) remains applied.
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 SIM800E Functional Diagram

The following figure shows a functional diagram of SIM800E:

- The GSM baseband engine
- Flash
- The GSM radio frequency part
- The antenna interface
- The other interfaces

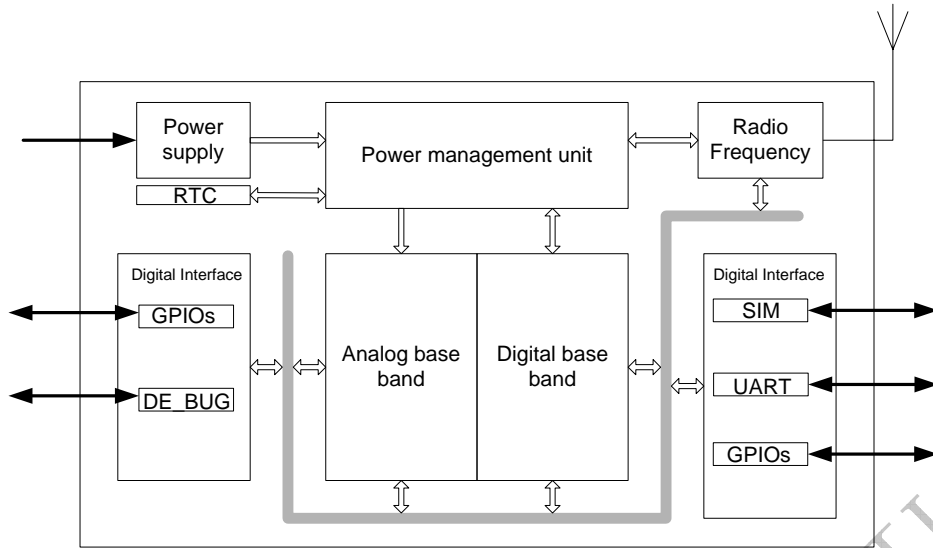


Figure 1: SIM800E functional diagram

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3 Package Information

3.1 Pin out Diagram

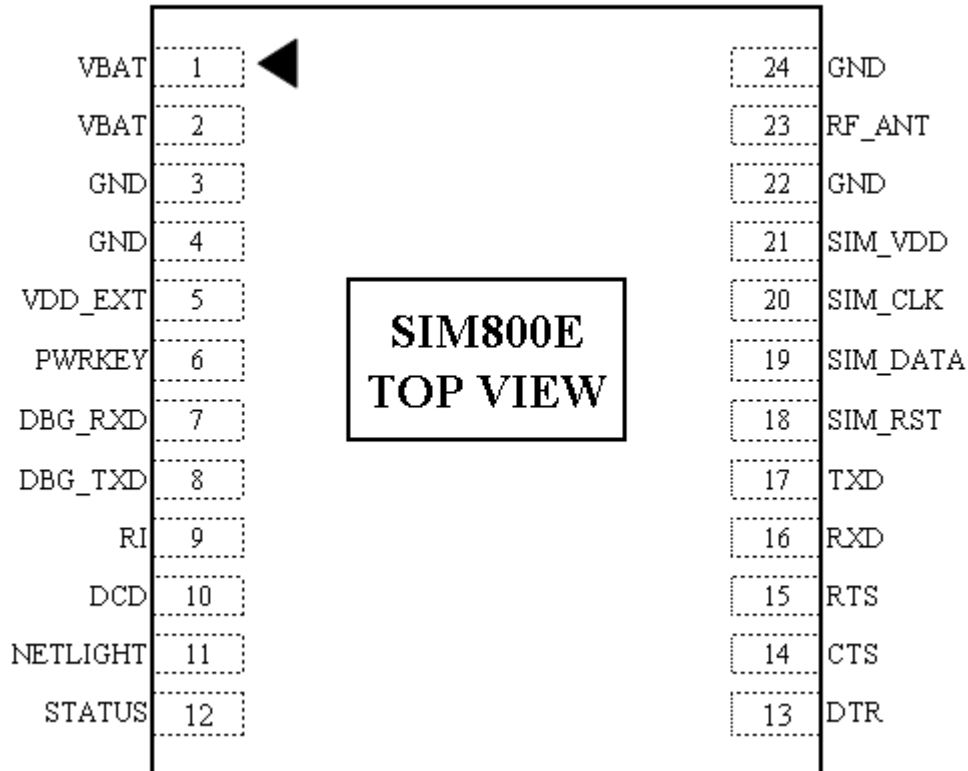


Figure 2: SIM800E pin out diagram (Top view)

3.2 Pin Description

Table 4: Pin description

Pin name	Pin number	I/O	Description	Comment
Power supply				
VBAT	1,2	I	Power supply	
VDD_EXT	5	O	2.8V output power supply	If it is unused, keep open.
GND	3,4,22,24		Ground	
Power on/down				
PWRKEY	6	I	PWRKEY should be pulled low at least 1 second and then released to power on/down the module.	Pulled up internally.
Module Status indication				

STATUS	12	O	Power on status	If these pins are unused, keep open.
NETLIGHT	11	O	Network status	
Serial port				
RXD	16	I	Receive data	If these pins are unused, keep open.
TXD	17	O	Transmit data	
CTS	14	O	Clear to send	
RTS	15	I	Request to send	
DCD	10	O	Data carrier detect	
RI	9	O	Ring indicator	
DTR	13	I	Data terminal ready	
Debug interface				
DBG_TXD	8	O	For debugging and upgrading firmware	If these pins are unused, keep open.
DBG_RXD	7	I		
SIM interface				
SIM_VDD	21	O	Voltage supply for SIM card. Support 1.8V or 3V SIM card	All signals of SIM interface should be protected against ESD with a TVS diode array.
SIM_DATA	19	I/O	SIM data input/output	
SIM_CLK	20	O	SIM clock	
SIM_RST	18	O	SIM reset	
RF interface				
RF_ANT	23	I/O	RF antenna connection	Impedence must be controlled to 50Ω.

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3.3 Package Dimensions

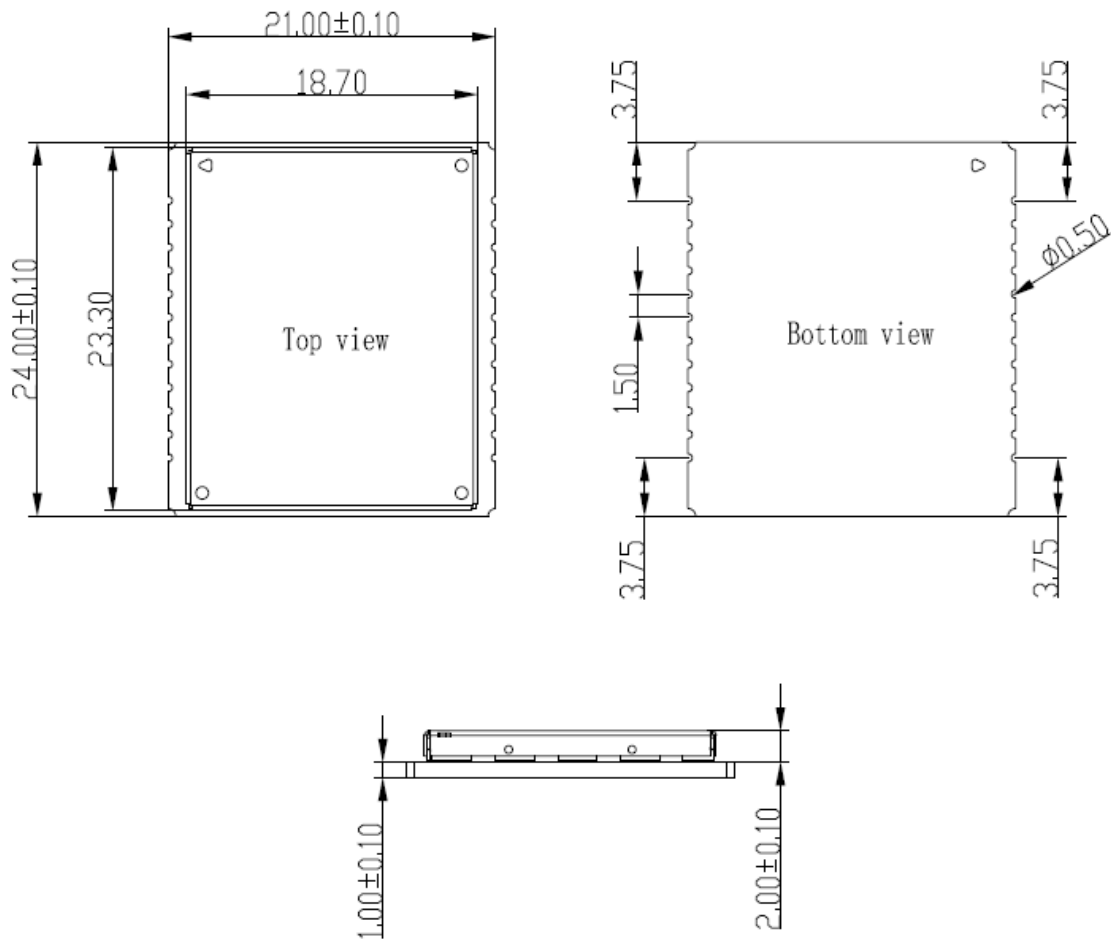


Figure 3: Dimensions of SIM800E (Unit: mm)

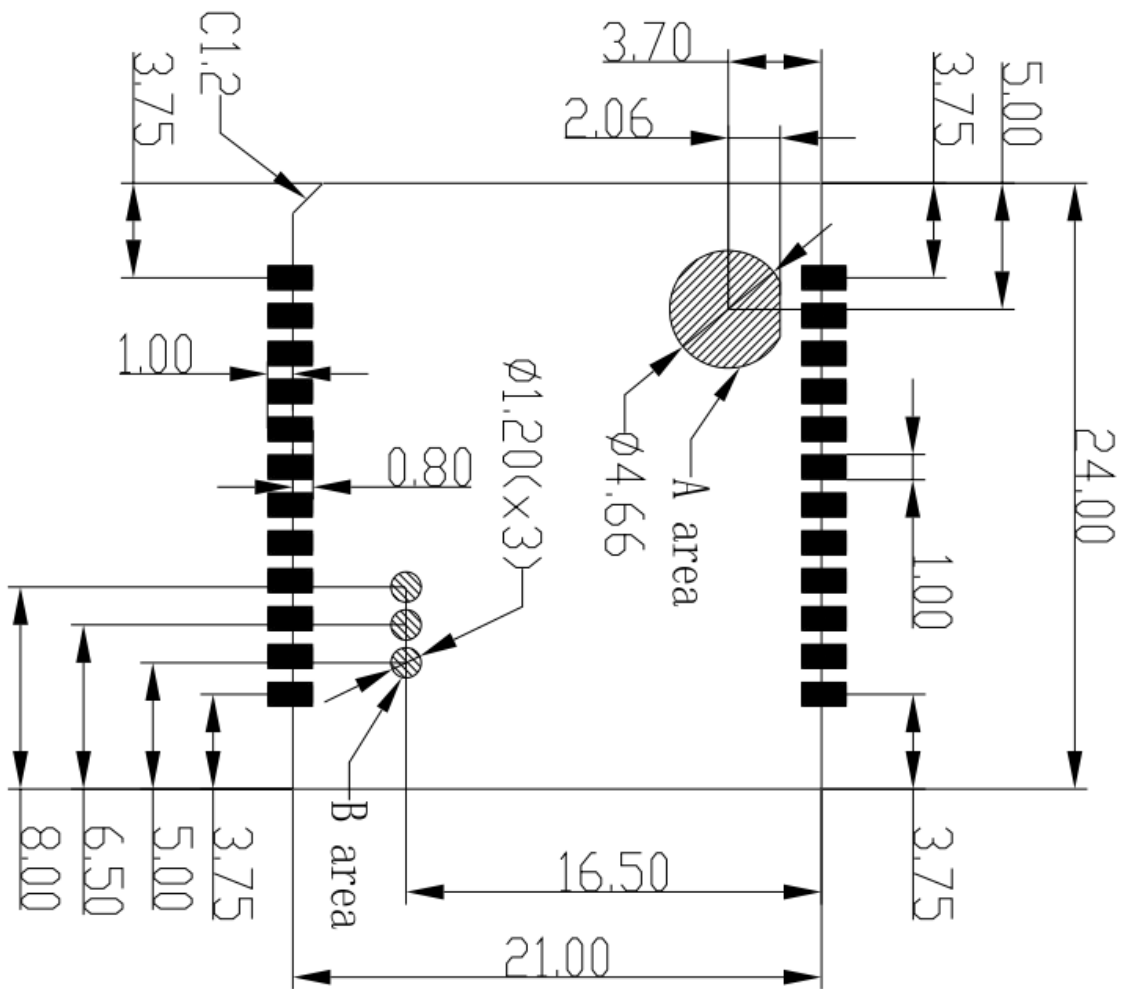


Figure 4: Recommended PCB footprint outline (Unit: mm)

Note: Keep copper out of area A. Do not place via in area B to avoid short circuit between the via on customer board and the test points on the bottom side of the module.

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4 Application Interface

4.1 Power Supply

The power supply range of SIM800E is from 3.4V to 4.5V. The transmitting burst will cause voltage drop and the power supply must be able to provide sufficient current up to 2A. For the VBAT input, a bypass capacitor (low ESR) such as a 100 μF is strongly recommended; this capacitor should be placed as close as possible to SIM800E VBAT pins. The following figure is the reference design of +5V input power supply. The designed output for the power supply is 4.1V, thus a linear regulator can be used.

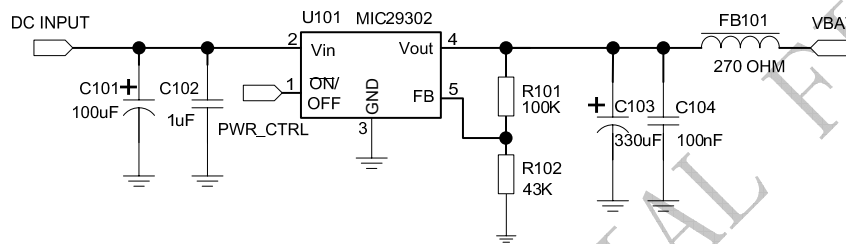


Figure 5: Reference circuit of the LDO power supply

If there is a high drop-out between the input and the desired output (VBAT), a DC-DC power supply will be preferable because of its better efficiency especially with the 2A peak current in burst mode of the module. The following figure is the reference circuit.

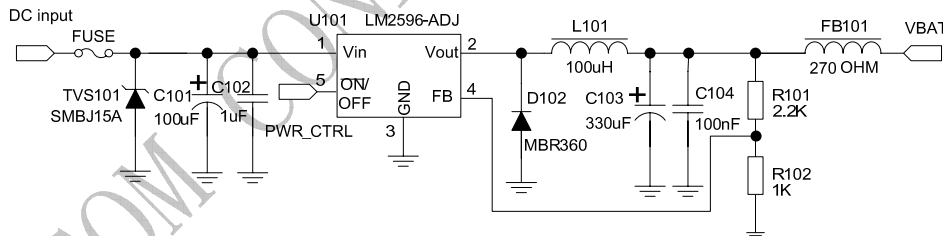


Figure 6: Reference circuit of the DC-DC power supply

The single 3.7V Li-ion cell battery can be connected to SIM800E VBAT pins directly. But the Ni-Cd or Ni-MH battery must be used carefully, since their maximum voltage can rise over the absolute maximum voltage of the module and damage it.

When battery is used, the total impedance between battery and VBAT pins should be less than 150m Ω . The following figure shows the VBAT voltage drop at the maximum power transmit phase, and the test condition is as following:

$$\text{VBAT}=4.0\text{V},$$

A VBAT bypass capacitor $C_A=100\mu\text{F}$ tantalum capacitor (ESR=0.7 Ω),

Another VBAT bypass capacitor $C_B=1\mu\text{F}$.

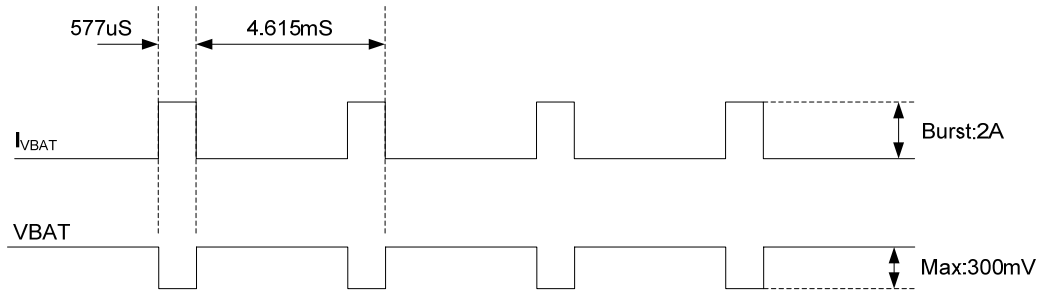


Figure 7: VBAT voltage drop during transmit burst

4.1.1 Minimizing Voltage Drop of VBAT

When designing the power supply in user’s application, pay special attention to power losses. Ensure that the input voltage never drops below 3.1V even when current consumption rises to 2A in the transmit burst. If the power voltage drops below 3.1V, the module may be shut down automatically. The PCB traces from the VBAT pins to the power supply must be wide enough (at least 60mil) to decrease voltage drops in the transmit burst. The power IC and the bypass capacitor should be placed to the module as close as possible.

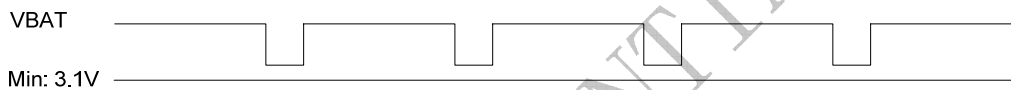


Figure 8: The minimal VBAT voltage requirement at VBAT drop

4.1.2 Monitoring Power Supply

The AT command “AT+CBC” can be used to monitor the VBAT voltage. For detail, please refer to *document [1]*.

4.2 Power on/down Scenarios

4.2.1 Power on SIM800E

User can power on SIM800E by pulling down the PWRKEY pin for at least 1 second and release. This pin is already pulled up to VBAT in the module internal, so external pull up is not necessary. Reference circuit is shown as below.

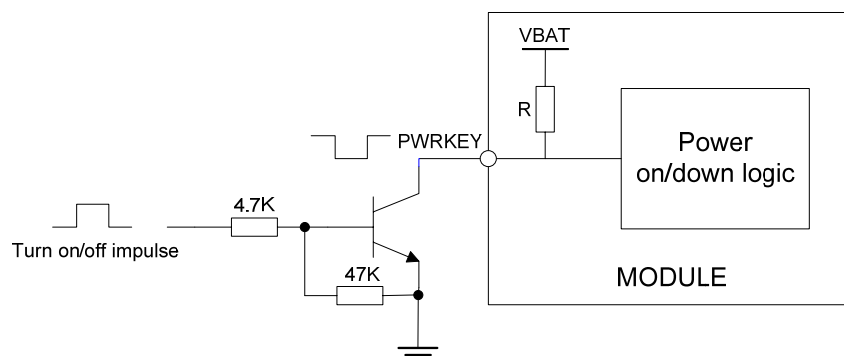


Figure 9: Powered on/down module using transistor

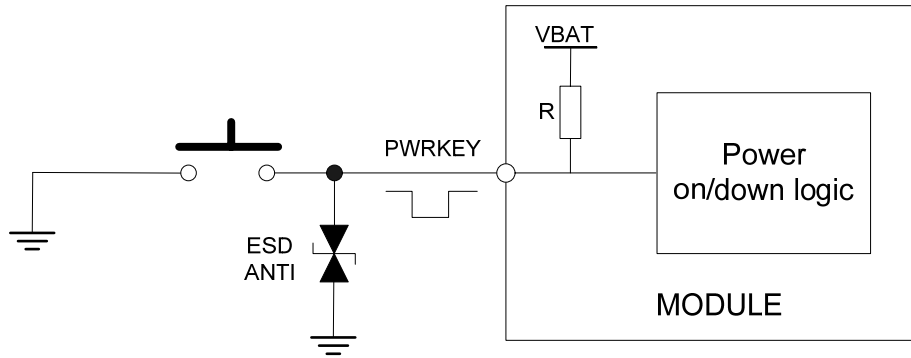


Figure 10: Powered on/down module using button

The power on scenarios is illustrated as following figure.

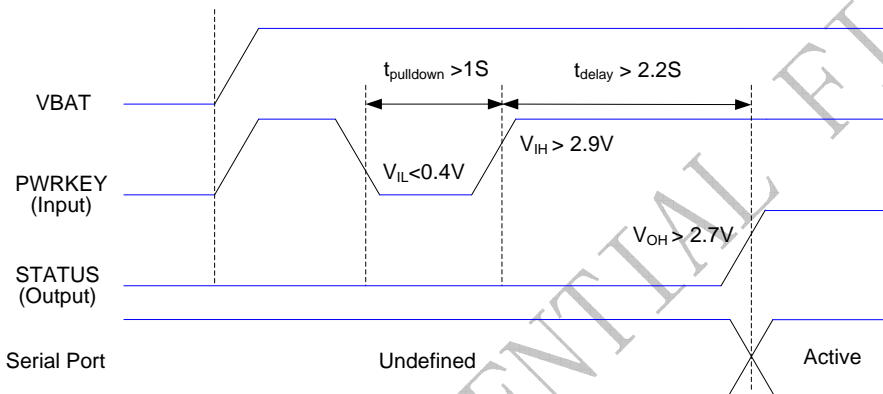


Figure 11: Timing of power on module

When power on procedure is completed, SIM800E will send following URC to indicate that the module is ready to operate at fixed baud rate.

RDY

This URC does not appear when autobauding function is active.

Note: User can use AT command “AT+IPR=x” to set a fixed baud rate and save the configuration to non-volatile flash memory. After the configuration is saved as fixed baud rate, the Code “RDY” should be received from the serial port every time when SIM800E is powered on. For details, please refer to the chapter “AT+IPR” in document [1].

4.2.2 Power down SIM800E

SIM800E will be powered down in the following situations:

- Normal power down procedure: power down SIM800E by the PWRKEY pin.
- Normal power down procedure: power down SIM800E by AT command “AT+CPOWD=1”.
- Abnormal power down: over-voltage or under-voltage automatic power down.
- Abnormal power down: over-temperature or under-temperature automatic power down.

4.2.2.1 Power down SIM800E by the PWRKEY Pin

User can power down SIM800E by pulling down the PWRKEY pin for at least 1 second and release. Please refer to the power on circuit. The power down scenario is illustrated in following figure.

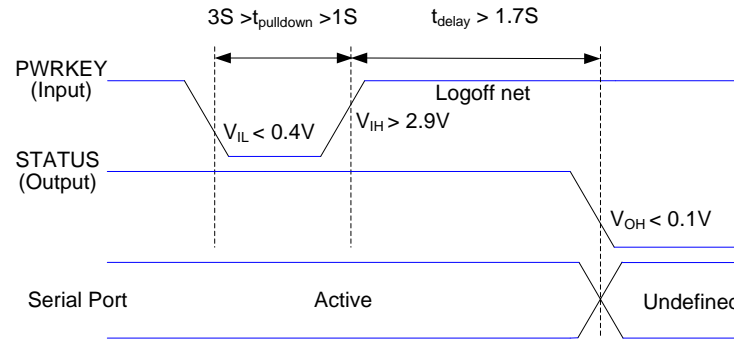


Figure 12: Timing of power down SIM800E by PWRKEY

This procedure makes the module log off from the network and allows the software to enter into a secure state to save data before completely shut down.

Before the completion of the power down procedure, the module will send URC:

NORMAL POWER DOWN

At this moment, AT commands can not be executed any more, and only the RTC is still active. Power down mode can also be indicated by STATUS pin, which is at low level at this time.

4.2.2.2 Power down SIM800E by AT Command

SIM800E can be powered down by AT command “AT+CPOWD=1”. This procedure makes the module log off from the network and allows the software to enter into a secure state to save data before completely shut down.

Before the completion of the power down procedure, the module will send URC:

NORMAL POWER DOWN

At this moment, AT commands cannot be executed any more, and only the RTC is still active. Power down mode can also be indicated by STATUS pin, which is at low level at this time.

For detail about the AT command “AT+CPOWD”, please refer to *document [1]*

4.2.2.3 Over-voltage or Under-voltage Power down

The module software monitors the VBAT voltage constantly.

If the voltage $\leq 3.5V$, the following URC will be reported:

UNDER-VOLTAGE WARNING

If the voltage $\geq 4.5V$, the following URC will be reported:

OVER-VOLTAGE WARNING

If the voltage $\leq 3.4V$, the following URC will be reported, and the module will be automatically powered down.

UNDER-VOLTAGE POWER DOWN

If the voltage $\geq 4.6V$, the following URC will be reported, and the module will be automatically powered down.

OVER-VOLTAGE POWER DOWN

At this moment, AT commands cannot be executed any more, and only the RTC is still active. Power down mode can also be indicated by STATUS pin, which is at low level at this time.

4.2.2.4 Over-temperature or Under-temperature Power down

The module will constantly monitor the temperature of the module,
If the temperature $> +80^{\circ}\text{C}$, the following URC will be reported:

+CMTE: 1

If the temperature $< -30^{\circ}\text{C}$, the following URC will be reported:

+CMTE:-1

If the temperature $> +85^{\circ}\text{C}$, the following URC will be reported, and the module will be automatically powered down.

+CMTE: 2

If the temperature $< -40^{\circ}\text{C}$, the following URC will be reported, and the module will be automatically powered down.

+CMTE:-2

At this moment, AT commands cannot be executed any more, and only the RTC is still active. Power down mode can also be indicated by STATUS pin, which is at low level at this time.

The AT command “AT+CMTE” could be used to read the temperature when the module is running.
For details please refer to *document [1]*.

4.2.3 Restart SIM800E by PWRKEY Pin

When the module works normally, if the user wants to restart the module, follow the procedure below:

- 1) Power down the module.
- 2) Wait for at least 800mS after STATUS pin changed to low level.
- 3) Power on the module.

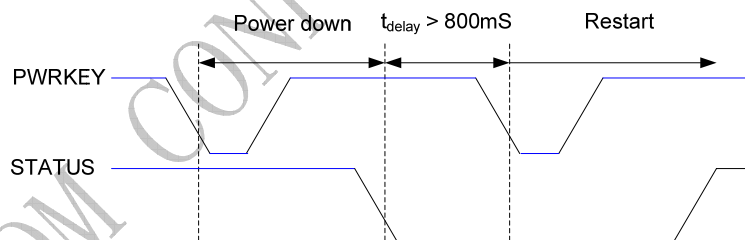


Figure 13: Timing of restart SIM800E

4.3 Power Saving Mode

SIM800E have two power saving modes: sleep mode and Minimum functionality modes. In sleep mode, the current of module is very low. The AT command “AT+CFUN=<fun>” can be used to set SIM800E into minimum functionality. When SIM800E is in sleep mode and minimum functionality, the current of module is lowest.

4.3.1 Minimum Functionality Mode

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.

- 0: minimum functionality.

- 1: full functionality (default).
- 4: flight mode (disable RF function).

Minimum functionality mode minimizes the current consumption to the lowest level. If SIM800E 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 is still accessible, but all AT commands correlative with RF function and SIM card function will not be accessible.

For detailed information about the AT Command “AT+CFUN=<fun>”, please refer to *document [1]*.

Table 5: The Current consumption of Minimum Functionality Mode

<fun>	Current consumption(uA) (sleep mode)
0	766
1	1375(BS-PA-MFRMS=2)
4	782

4.3.2 Sleep Mode

User can control SIM800E module to enter or exit the sleep mode. If the module is set to “AT+CSCLK=1”, the user can control the module to enter or exit the sleep mode through the DTR. When the DTR is set to the high level, SIM800E will enter sleep mode automatically. In this mode, SIM800E can still receive paging or SMS from network but the serial port is not accessible.

Note: For SIM800E, It is requested to set AT command “AT+CSCLK=1” to enable the sleep mode; the default value is 0, which cannot make the module to enter sleep mode. For more details please refer to document [1].

4.3.3 Wake Up SIM800E from Sleep Mode

When SIM800E is in sleep mode, the following methods can wake up the module:

- Receive an external interrupt to wake up.
- Use the DTR to wake up. Use can pull down the DTR to a low level; it will wake up the module from the sleep mode. The serial port will be active about the 20ms after the DTR changed the low level.
- Receive a data call from network.
- Receive a SMS from network.

4.4 Serial Interfaces

SIM800E provides two unbalanced asynchronous serial ports. One is the serial port and the other is the debug port. The module is designed as a DCE (Data Communication Equipment). The following figure shows the connection between module and client (DTE).

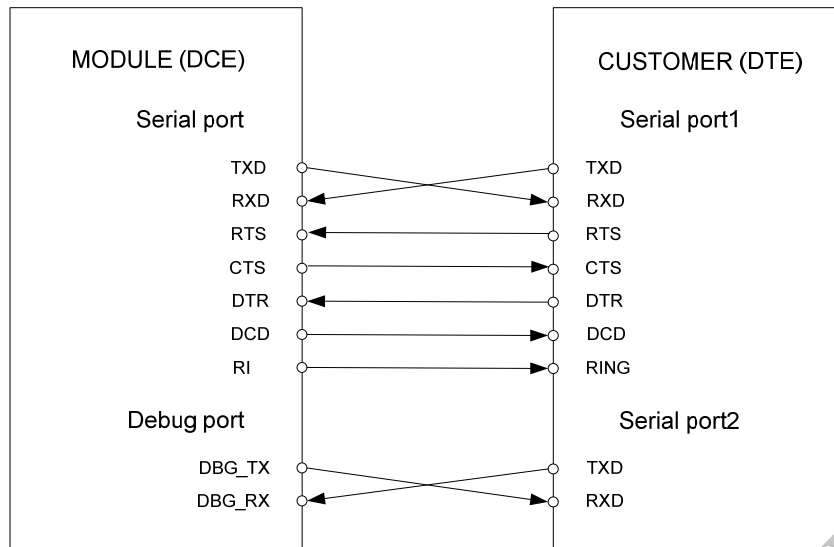


Figure 14: Connection of the serial interfaces

If only RXD and TXD are used in user’s application, other serial pins should be kept open. Please refer to following figure.

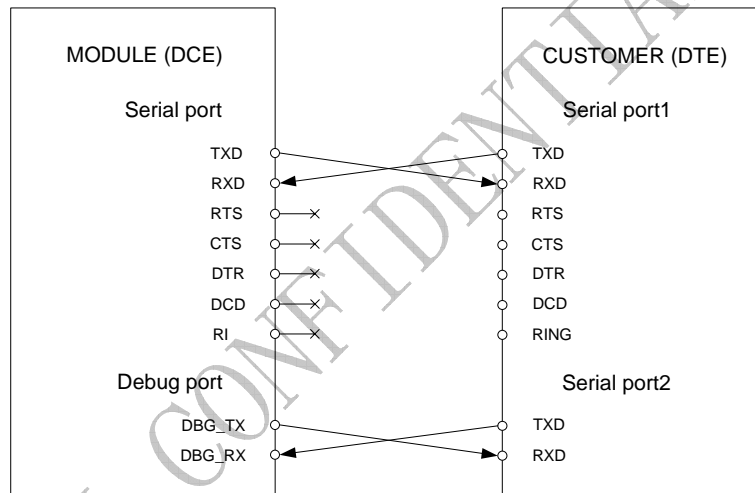


Figure 15: Connection of RXD and TXD only

4.4.1 Function of Serial Port and Debug Port

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 CSD FAX, GPRS service and AT communication. It can also be used for multiplexing function. For details about multiplexing function, please refer to *document [3]*.
- Serial port supports the following baud rates:
0,1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200bps
- Autobauding only supports the following baud rates:
1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200bps
- The default setting is 115200.

following requirements:

- **Synchronization between DTE and DCE:**

When DCE powers on with autobauding enabled, user must firstly send character “AT” to synchronize the baud rate. It is recommended to send “AT” until DTE receives the “OK” response, which means DTE and DCE are correctly synchronized. For more information please refer to the AT command “AT+IPR”.

- **Restrictions of autobauding operation:**

The DTE serial port must be set at 8 data bits, no parity and 1 stop bit.

The URC such as "RDY", "+CFUN: 1" and "+CPIN: READY" will not be reported.

Note: User can use AT command “AT+IPR=x” to set a fixed baud rate and the setting will be saved to non-volatile flash memory automatically. After the configuration is set as fixed baud rate, the URC such as "RDY", "+CFUN: 1" and "+CPIN: READY" will be reported when SIM800E is powered on.

Debug port:

- Used for debugging.
- Debug port supports the baud rate of 115200bps.

4.4.2 Software Debug

Refer to the following figure for debugging.

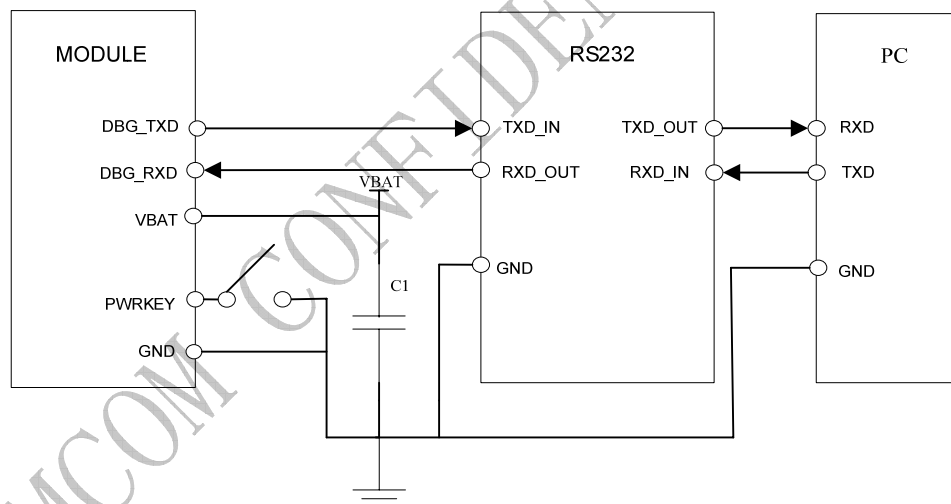


Figure 16: Connection for software debugging

The debug port supports the CMOS level. If user connects the module to the computer, the level shifter should be added between the DCE and DTE.

4.4.3 Software Upgrading

Refer to the following figure for upgrading software.

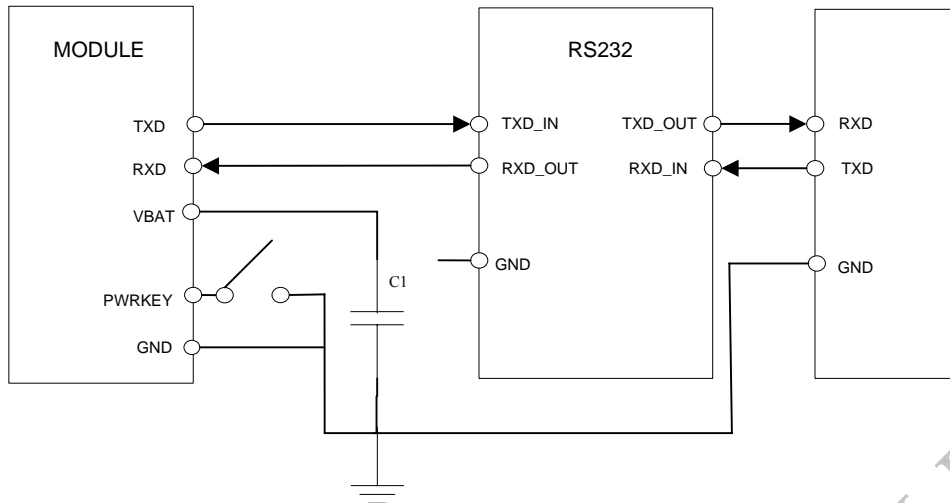


Figure 17: Connection for software upgrading

The serial port supports the CMOS level. If user connects the module to the computer, the level shifter should be added between the DCE and DTE.

4.5 SIM Card Interface

4.5.1 SIM Card Application

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.

It is recommended to use an ESD protection component such as ST (www.st.com) ESDA6V1W5 or ON SEMI (www.onsemi.com) SMF05C. The pull up resistor (15KΩ) on the SIM_DATA line is already added in the module internal. Note that the SIM peripheral circuit should be close to the SIM card socket. The reference circuit of the 6-pin SIM card holder is illustrated in the following figure.

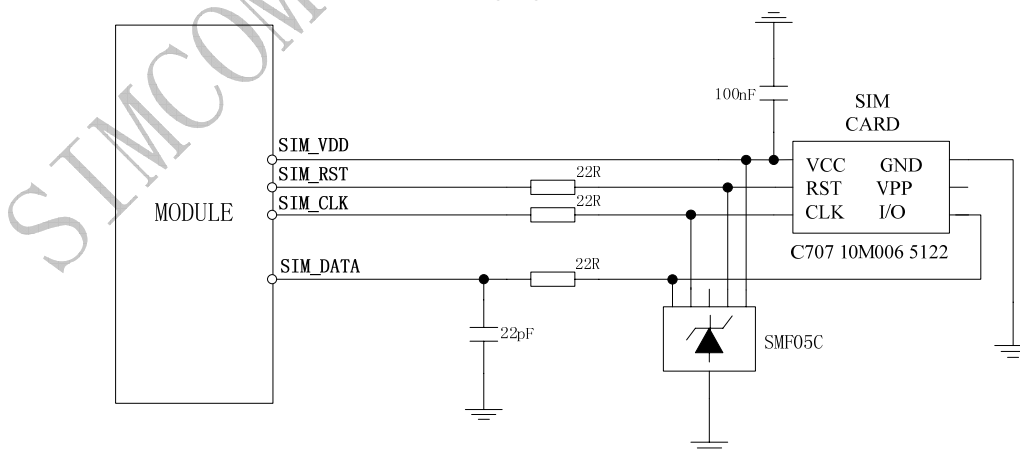


Figure 18: Reference circuit of the 6-pin SIM card holder

4.5.2 Design Considerations for SIM Card Holder

For 6-pin SIM card holder, SIMCom recommends to use Amphenol C707 10M006 5122 .User can visit [SIM800E_Hardware Design_V1.00](#)

<http://www.amphenol.com> for more information about the holder.

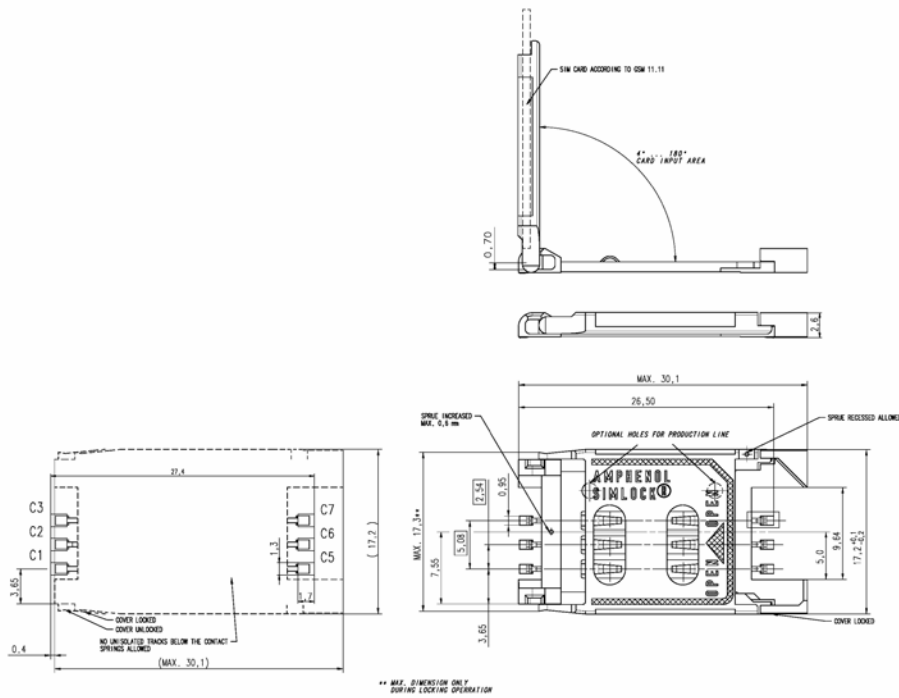


Figure 19: Amphenol C707 10M006 5122 SIM card holder

Table 6: Pin description (Amphenol SIM card holder)

Pin name	Signal	Description
C1	SIM_VDD	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

4.6 RI Behaviors

Table 7: RI Behaviors

State	RI response
Standby	High
Data call	The pin is changed to low. When any of the following events occur, the pin will be changed to high: (1) Establish the call (2) Hang up the call
SMS	The pin is changed to low, and kept low for 120ms when a SMS is received. Then it is changed to high.
URC	The pin is changed to low, and kept low for 120ms when some URCs are reported. Then it is changed to high.

The behavior of the RI pin is shown in the following figure when the module is used as a receiver.

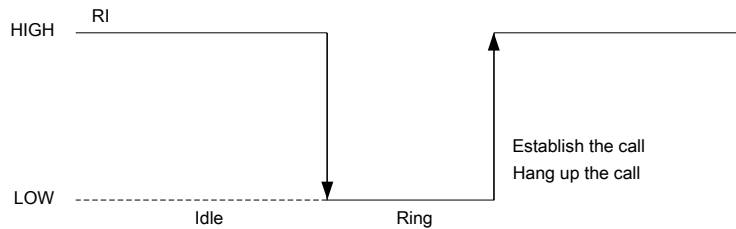


Figure 20: RI behaviour of data calling as a receiver

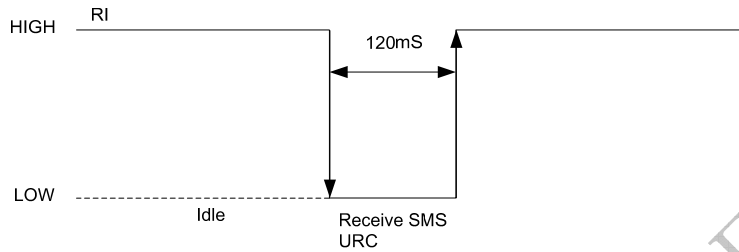


Figure 21: RI behaviour of URC or receive SMS

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

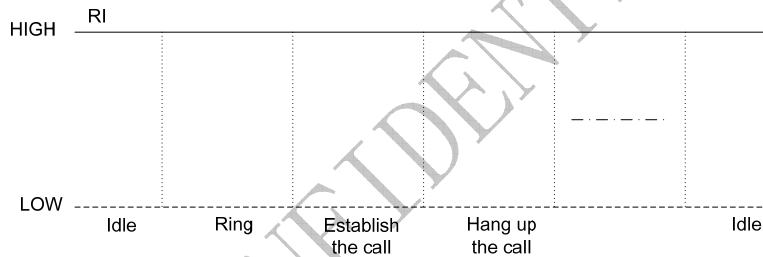


Figure 22: RI behaviour as a caller

4.7 Network Status Indication

The NETLIGHT pin can be used to drive a network status indication LED. The status of this pin is listed in following table:

Table 8: Status of the NETLIGHT pin

Status	SIM800E behavior
Off	SIM800E is not running
64ms On/ 800ms Off	SIM800E not registered the network
64ms On/ 3000ms Off	SIM800E registered to the network
64ms On/ 300ms Off	PPP GPRS communication is established

A reference circuit is recommended in the following figure:

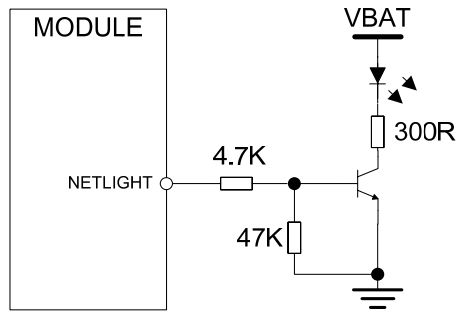


Figure 23: Reference circuit of NETLIGHT

4.8 Antenna Interface

SIM800E provides a RF antenna interface. The customer's antenna should be located in the customer's main board and connected to the module's antenna pad through microstrip line or other types of RF traces whose impedance must be controlled in 50Ω . To facilitate the antenna tuning and certification test, a RF connector and an antenna matching circuit should be added. The following figure is the recommended circuit.

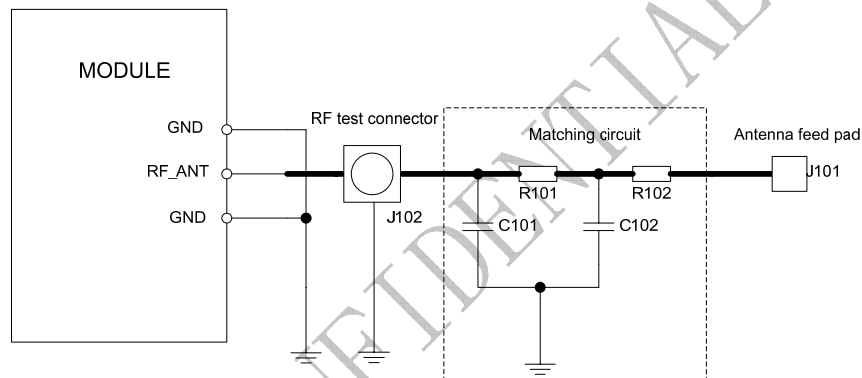


Figure 24: Antenna matching circuit

In this figure, the components R101, R102, C101 and C102 is used for antenna matching, the components' value only can be got after the antenna tuning. Usually, the matching components' value is provided by antenna vendor, the default value of R101 and R102 are 0Ω , and reserve the places of C101 and C102 without soldering.

The RF test connector in above figure is used for RF conduction performance test, and should be placed as close as possible to the module's RF_ANT pin. The traces in bold type should be treated as 50Ω impedance controlled line in PCB layout.

5 Electrical, Reliability and Radio Characteristics

5.1 Absolute Maximum Ratings

The absolute maximum ratings stated in following table are stress ratings under non-operating conditions. Stresses beyond any of these limits will cause permanent damage to SIM800E.

Table 9: Absolute maximum ratings

Symbol	Parameter	Min	Typ	Max	Unit
V _{BAT}	Power supply voltage	-0.3	-	4.73	V
V _I *	Input voltage	-0.3	-	3.63	V
I _I *	Input current	-	-	8	mA
I _O *	Output current	-	-	8	mA

* These parameters are for digital interface pins, such as Serial port, GPIO, and DEBUG.

5.2 Recommended Operating Conditions

Table 10: Recommended operating conditions

Symbol	Parameter	Min	Typ	Max	Unit
V _{BAT}	Power supply voltage	3.4	4.0	4.5	V
T _{OPER}	Operating temperature	-30	+25	+80	°C
T _{STG}	Storage temperature	-45		+90	°C

5.3 Digital Interface Characteristics

Table 11: Digital interface characteristics

Symbol	Parameter	Min	Typ	Max	Unit
V _{IH}	High-level input voltage	2.1	-	3.1	V
V _{IL}	Low-level input voltage	-0.3	-	0.7	V
V _{OH}	High-level output voltage	2.4	-	2.8	V
V _{OL}	Low-level output voltage	-	-	0.4	V

* These parameters are for digital interface pins, such as. Serial port, GPIO, and DEBUG.

5.4 SIM Card Interface Characteristics

Table 12: 3V SIM card interface characteristics

Symbol	Parameter	Min	Typ	Max	Unit
I _{IM}	input max current	-1	-	1	mA
I _{OM}	output max current	-1	-	1	mA
V _{IH}	High-level input voltage	2.4	-	-	V
V _{IL}	Low-level input voltage	-	-	0.4	V
V _{OH}	High-level output voltage	2.7	-	-	V
V _{OL}	Low-level output voltage	-	-	0.4	V

Table 13: 1.8V SIM card interface characteristics

Symbol	Parameter	Min	Typ	Max	Unit
I _{IM}	input max current	-1	-	1	mA
I _{OM}	output max current	-1	-	1	mA
V _{IH}	High-level input voltage	1.4	-	-	V
V _{IL}	Low-level input voltage	-	-	0.27	V
V _{OH}	High-level output voltage	1.62	-	-	V
V _{OL}	Low-level output voltage	-	-	0.36	V

5.5 VDD_EXT Characteristics

Table 14: VDD_EXT characteristics

Symbol	Parameter	Min	Typ	Max	Unit
V _O	Output voltage	2.70	2.80	2.9	V
I _O	Output current	-	-	100	mA

5.6 SIM_VDD Characteristics

Table 15: SIM_VDD characteristics

Symbol	Parameter	Min	Typ	Max	Unit
V _O	Output voltage	-	3.0	-	V
		-	1.80	-	
I _O	Output current	-	-	10	mA

5.7 Current Consumption (VBAT = 3.8V)

Table 16: Current consumption

Symbol	Parameter	Conditions	Value	Unit		
I _{VBAT}	VBAT current	Power down mode	30	uA		
		Sleep mode	BS-PA-MFRMS=9	0.83	mA	
			BS-PA-MFRMS=5	0.96		
			BS-PA-MFRMS=2	1.38		
		Idle mode	EGSM 900	22	mA	
			DCS 1800			
		Data mode GPRS(1Rx,4Tx)	EGSM 900	PCL=5	479	mA
				PCL=12	209	
				PCL=19	115	
			DCS 1800	PCL=0	362	
				PCL=7	171	
				PCL=15	98	
		Data mode GPRS(4Rx,1Tx)	EGSM 900	PCL=5	205	mA
				PCL=12	89	
				PCL=19	66	
			DCS 1800	PCL=0	161	
				PCL=7	80	
				PCL=15	62	
		Data mode GPRS(3Rx,2Tx)	EGSM 900	PCL=5	340	mA
				PCL=12	137	
				PCL=19	90	
DCS 1800	PCL=0		262			
	PCL=7		119			
	PCL=15		82			
I _{VBAT-peak}	Peak current	During Tx burst	2	A		

5.8 Electro-Static Discharge

SIM800E 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 17: The ESD characteristics (Temperature: 25°C, Humidity: 45 %)

Pin	Contact discharge	Air discharge
VBAT	±5KV	±10KV
GND	±5KV	±10KV
RXD, TXD	±3KV	±6KV
Antenna port	±5KV	±10KV
PWRKEY	±4KV	±8KV

5.9 Radio Characteristics

5.9.1 Module RF Output Power

The following table shows the module's conducted output power, it is followed by the 3GPP TS 05.05 technical specification requirement.

Table 18: SIM800E GSM 900 conducted RF output power

GSM 900			
PCL	Nominal output power (dBm)	Tolerance (dB) for conditions	
		Normal	Extreme
5	33	±2	±2.5
6	31	±3	±4
7	29	±3	±4
8	27	±3	±4
9	25	±3	±4
10	23	±3	±4
11	21	±3	±4
12	19	±3	±4
13	17	±3	±4
14	15	±3	±4
15	13	±3	±4
16	11	±5	±6
17	9	±5	±6
18	7	±5	±6
19-31	5	±5	±6

Table 19: SIM800E DCS 1800 conducted RF output power

DCS 1800			
PCL	Nominal output power (dBm)	Tolerance (dB) for conditions	
		Normal	Extreme
0	30	±2	±2.5
1	28	±3	±4
2	26	±3	±4
3	24	±3	±4
4	22	±3	±4
5	20	±3	±4
6	18	±3	±4
7	16	±3	±4
8	14	±3	±4
9	12	±4	±5

10	10	±4	±5
11	8	±4	±5
12	6	±4	±5
13	4	±4	±5
14	2	±5	±6
15-28	0	±5	±6

5.9.2 Module RF Receive Sensitivity

The following table shows the module's conducted receive sensitivity, it is tested under static condition.

Table 20: SIM800E conducted RF receive sensitivity

Frequency	Receive sensitivity (Typical)	Receive sensitivity(Max)
EGSM900	-109dBm	-107dBm
DCS1800	-109dBm	-107dBm

5.9.3 Module Operating Frequencies

The following table shows the module's operating frequency range; it is followed by the 3GPP TS 05.05 technical specification requirement.

Table 21: SIM800E operating frequencies

Frequency	Receive	Transmit
EGSM900	925 ~ 960MHz	880 ~ 915MHz
DCS1800	1805 ~ 1880MHz	1710 ~ 1785MHz

6 Manufacturing

6.1 Top and Bottom View of SIM800E

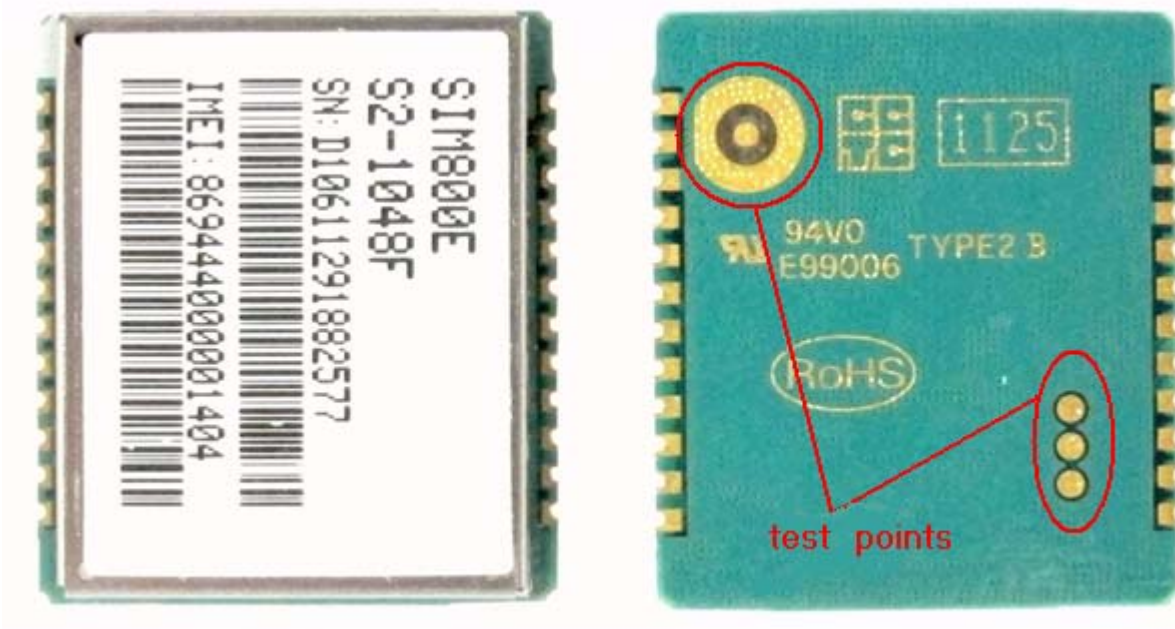


Figure 25: Top and bottom view of SIM800E

These test points are only used for module manufacturing and testing. They are not for customer using.

6.2 Typical Solder Reflow Profile

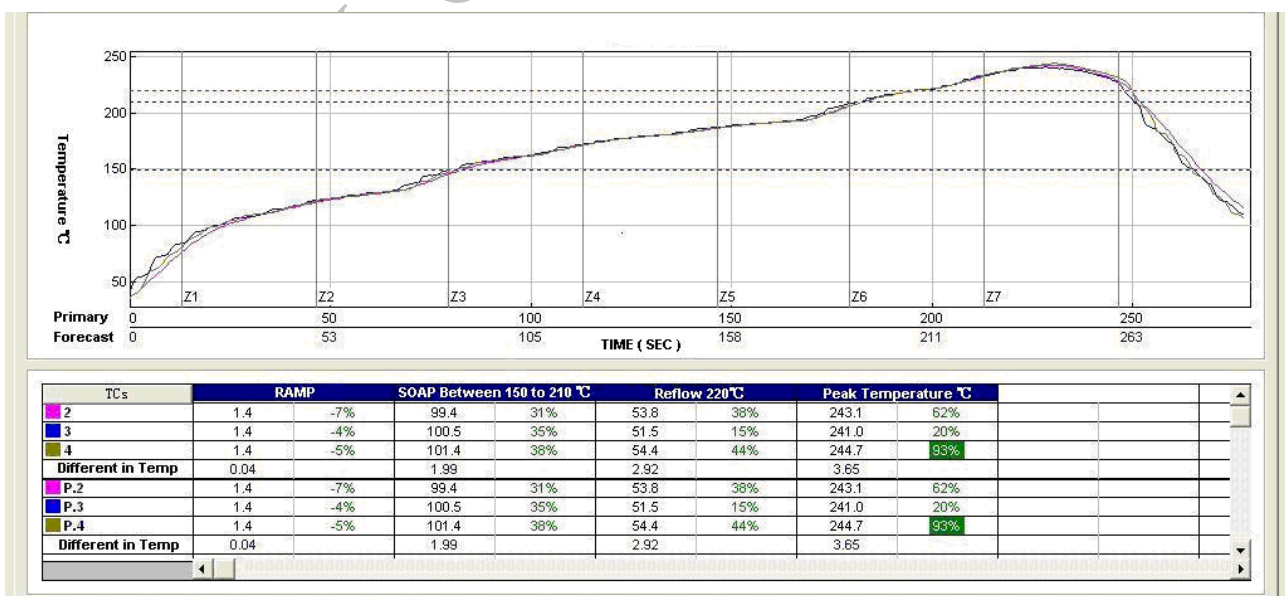


Figure 26: Typical Solder Reflow Profile

For details about secondary SMT, please refer to *document [10]*.

6.3 Moisture Sensitivity Level (MSL)

SIM800E is qualified to MSL3 in accordance with IPC/JEDEC J-STD-033.

Appendix

A. Related Documents

Table 22: Related documents

SN	Document name	Remark
[1]	SIM800E_AT Command Manual	SIM800E AT Command Manual
[2]	AN_Serial Port	AN_Serial Port
[3]	ITU-T Draft new recommendation V.25ter:	Serial asynchronous automatic dialing and control
[4]	GSM 07.07:	Digital cellular telecommunications (Phase 2+); AT command set for GSM Mobile Equipment (ME)
[5]	GSM 07.10:	Support GSM 07.10 multiplexing protocol
[6]	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)
[7]	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
[8]	GSM 11.11:	Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface
[9]	GSM 03.38:	Digital cellular telecommunications system (Phase 2+); Alphabets and language-specific information
[10]	GSM 11.10	Digital cellular telecommunications system (Phase 2); Mobile Station (MS) conformance specification; Part 1: Conformance specification

B. Terms and Abbreviations







Table 23: 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
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

C. Safety Caution

Table 24: 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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