SIM7672X & SIM7652X Series_Sleep Mode_ Application Note

LTE Module

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About Document

Version History

Version	Date	Owner	Description
V1.00	2023.5.22		New version

Scope

Based on module AT command manual, this document will introduce Sleep mode application process. Developers could understand and develop application quickly and efficiently based on this document. This document applies to SIM7672X Series, SIM7652X Series.

Contents

1 Introduction

1.1 Purpose of the document

This document describes what conditions are required to make the module enter the sleep mode and how to wake up the module.

1.2 Related documents

[1] SIM7672X & SIM7652X Series_AT Command Manual.

2 Sleep depth

ACTIVE state：The PMU Module is off, even if there is nothing to do, the MCU is still waiting in while loop. The power consumption is the largest.

IDLE state: At this state MCU will turn off the core clock when there is no task, all system interrupt can wake up the system and restart the core clock.

SLEEP1 state: All peripherals are powered down on the basis of IDLE state, and peripheral interrupts cannot wake up the system.

OFF state: Power off the chip, can wake-up only by PWRKEY.

> **NOTE**
>
> ● The sleep depth we set is SLEEP1 state about *AT+CSCLK=1 or AT+CSCLK=2*. All tasks equally determine sleep. The sleep state is influenced by various factors, and they will undergo a voting mechanism and eventually enter sleep mode.

3 Sleep

3.1 Sleep conditions

Minimum functionality mode ceases a majority function of the module, to enable the module enter the minimum power consumption mode, the following hardware and software conditions must be followed:

(1) Module is in normal mode.
(2) Send AT command "*AT+CFUN=0*".
(3) Send AT command "*AT+CSCLK=1*" or "*AT+CSCLK=2*".
(4) DTR pin pulled to high level and USB_ VBUS pulled to low level.

This mode is set by the AT command which provides a choice of the functionality levels.

AT+CFUN=0: Minimum functionality
AT+CFUN=1: Full functionality (Default)
AT+CFUN=4: Flight mode

If module has been set to minimum functionality mode, the RF function and SIM card function will be closed. In this case, the serial port and USB are still accessible, but RF function and SIM card will be unavailable. If module has been set to flight mode, the RF function will be closed. In this case, the serial port and USB are still accessible, but RF function will be unavailable.

3.2 Sleep steps

1.Send the AT command "*AT+CSCLK=1*" or "*AT+CSCLK=2*".

2.Send the AT command "*AT+CFUN=0*".(optional)

3.Unplug USB.

4. Pull up DTR.

> **NOTE**
>
> ● If *'AT+CFUN=0'* is not sent, the module may not be able to sleep or will not sleep for a long time.

3.3 Sleep status

1.The network light is off.

2.Sending instructions through serial port is not possible.

3.We can see the sign 'enter sleep' in the log.

4.measure power consumption below 1mA.

4 Wake Up

4.1 Wake Up Source

The chip has six wake-up sources:wakeup0,wakeup1,wakeup2,wakeup3,wakeup4,wakeup5. This wake-up method is mainly determined by the hardware.For example, DTR, serial port RX, VBUS, these three commonly used wake-up methods on our end.

4.2 Wake up method

(1)*AT+CSCLK=1*

When we use *AT+CSCLK=1*, then unplug the USB and raise the DTR to sleep, we can wake up the module by plugging in the USB or lowering the DTR, The main phenomenon observed is that commands can be sent, followed by the network light being on.

(2)*AT+CSCLK=2*

When we use AT+CSCLK=2 to hibernate the module, we can use the main serial port to send data for module wake-up when unplugging the USB, similar to AT+CSCLK=1.

5 AT Commands for Sleep

5.1 AT+CSCLK Control Sleep

This command is used to enable UART Sleep or always work. If set to 0, UART always work. If set to 1, ensure that DTR is pulled high and the module can go to DTR sleep. If set to 2, the module will enter RX sleep. RX wake-up directly sends data through the serial port (for example: AT) to wake-up.

AT+CSCLK	Control UART Sleep
Test Command **AT+CSCLK=?**	Response **+CSCLK: (**range of supported **<status>s**) **OK**
Read Command **AT+CSCLK?**	Response **+CSCLK: <status>** **OK**
Write Command **AT+CSCLK=<status>**	Response 1) **OK** 2) **ERROR**
Execution Command **AT+CSCLK**	Response Set <status>=0: **OK**
Parameter Saving Mode	NO_SAVE
Max Response Time	9000ms
Reference	-

Defined Values

<status>	0	off
	1	DTR sleep
	2	RX sleep

Examples

AT+CSCLK?
+CSCLK: 0

```
OK
AT+CSCLK=?
+CSCLK: (0-2)

OK
AT+CSCLK=1
OK
AT+CSCLK=2
OK
AT+CSCLK
OK
```