A7600 Series_Sleep Mode _Application Note_V1.00

LTE Module

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Document Title:	A7600 Series_Sleep Mode_Application Note_V1.00
Version:	1.00
Date:	2020.08.18
Status:	Released

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About Document

Version History

Version	Date	Owner	What is new
1.00	2020.08.18	Tao.huang	New version

Scope

This document can apply to A7600 Series, including A7600XX-XXXX, A5360E and A7670X.

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 or how to wake up the host by the module.

1.2 Related documents

[1] A7600 Series_AT Command Manual

1.3 Conventions and abbreviations

2 Sleep Condition

A7600 series modules can enter the sleep mode automatically to conserve power when some conditions are satisfied.
From the working mode to the sleep mode, the module takes about 10 to 20 seconds.
During the sleep mode, A7600 series modules can still receive the paging, the SMS and the call from the network.

Several hardware and software conditions must be satisfied together in order to enter sleep mode:
(1) UART condition
(2) USB condition
(3) Software condition

2.1 UART Condition

Even if the TE does not use the UART interface, this condition cannot be ignored since DTR pin can be used as the UART sleep indicator.

Host device can use DTR as an indicator to let modules enter the sleep mode:
- UART is ready to enter the sleep mode if DTR pin is pulled up.
- UART is ready to exit from the sleep mode if DTR pin is pulled down.

NOTE

- Since this is not a default function, users can send AT+CSCLK=1 command to the module firstly to enable this function.
- USB interface should be disconnected if module enter the sleep mode by the UART condition.

2.2 USB Condition

This condition must be taken seriously if USB interface is used, otherwise this interface can be disconnected.

If CPU on the host side supports USB suspend mode, there has nothing to do, since the USB controller will send suspend command to the module if the BUS is idle for some time.

If CPU on the host side doesn't support USB suspend mode, the host needs to cut off USB_VBUS line in order to let the module enter sleep mode. One can use a host GPIO to control an analog switch on/off.

If the host is the embedded system. The host needs to send suspend command to make the USB suspend.

NOTE

USB condition also needs to send AT+CSCLK=1 command to module firstly to enable the sleep function.

2.3 Software Condition

A7600 series modules must in the idle mode (no data transmission, no audio playing, no other AT command running and so on) in order to let modules enter the sleep mode.

The table as followed is the module sleep conditions by the connected port.

Connect port Condition	UART	USB	Software
UART	✓		✓
USB	✓	✓	✓
USB+UART	✓	✓	✓

3 Wake Up Condition

3.1 Wake Up Modules

A7600 series modules can exit from the sleep mode automatically when the following events are satisfied:

- Receive a SMS.
- Have an Incoming call.

A7600 series modules can exit from the sleep mode manually when the following events are happened:

- UART event:

DTR is pulled down if waking-up module is required.

- USB event:

The host sends a resume command to the module when in the suspend mode or the host connects the USB interface when the host cuts off the USB_VBUS line.

3.2 Wake Up Host

In UART A7600 modules uses RI pin to wake up the host only when incoming call happened, SMS received, and URC reported.
RI pin has same patterns to wake up the host; the pin will stay high normally:

When URC reported this pin will set to low about 60ms to inform host and then reset to high automatically, depend on (AT+CFGRI=1).

When SMS received this pin will set to low about 120ms to inform host and then reset to high automatically.

When incoming voice(volte) call happened this pin will set to low about 5900ms and set to high about last 100ms to inform host, it will loop this action until the host reset this pin with answer or hang up this call.

NOTE

- If user set the AT+CFGRI=1, the pin “RI” will be set low by receiving SMS and any URC report.
- If user set the AT+CFGRI=0(Default setting), the pin “RI” will be set low by receiving SMS only.
- when incoming voice(volte) call, the pin “RI” function always valid.

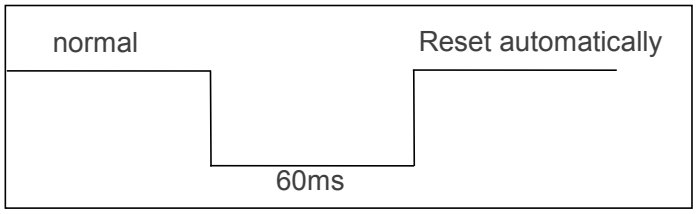

Figure 1: UART RI behavior when URC reported

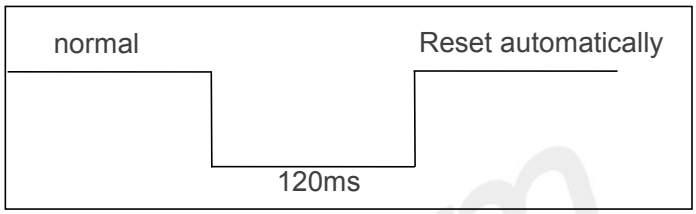

Figure 2: UART RI behavior when SMS received

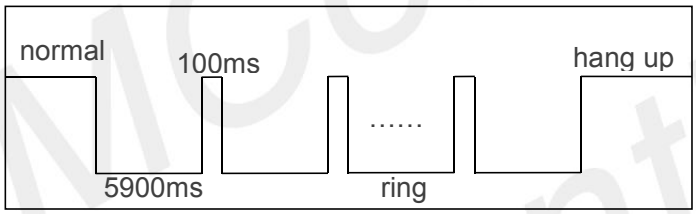

Figure 3: UART RI behavior when incoming call

4 Sleep or Wakeup State

Module can use NETLIGHT pin as an indicator of sleep or wakeup state.

If module from wakeup to sleep state, NETLIGHT pin set to low.

If module from sleep to wakeup state, NETLIGHT pin set to high, and NETLIGHT pin will be go to breathing state, in breathing state, breathing rate depends on network state.

The LED status is listed in the following table.

Table 1: Network Status Indication LED Status

LED Status	Module Status
On	Searching Network; Call Connect
200ms On, 200ms Off	Data Transmit; 4G registered
800ms On, 800ms Off	2G/3G registered network
Off	Power off; Sleep