



A76XX Series_UART _Application Note

LTE Module

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About Document

Version History

Version	Date	Chapter	What is new
1.00	2020.11.18		New version
1.01	2021.05.14		GENERAL NOTES COPYRIGHT
V1.02	2021.11.08	Scope	Scope description is updated

Scope

Based on module AT command manual, this document will introduce UART application process. Developers could understand and develop application quickly and efficiently based on this document. This document applies to A1803S Series, A1603 Series, A1601 Series and A1802 Series.

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1 Introduction

1.1 Purpose of the document

This document describes how to use UART interface of A76XX series, the UART mainly refers to a full function serial port. Examples are also given for reference. This document can be used for modules of A76XX series.

1.2 Related documents

- [1] A76XXSeries_AT Command Manual
- [2] A76XXSeries_SleepMode_Application Note
- [3] A76XXC1_Hardware Design Manual

1.3 Conventions and abbreviations

缩写	描述
DTE	Data terminal equipment
DCE	Data communications equipment
UART	Universal asynchronous receiver/transmitter
RXD	Receive data
TXD	Transmit data
RTS	Request to send
CTS	Clear to send
DCD	Data carrier detect
DTR	Data terminal ready
RI	Ring indicator

2 UART Introduction

The UART is a universal serial data bus for asynchronous communication. The bus is bidirectional communication, which can realize full duplex transmission and receiving.

The UART port has several features:

- Support High-speed UART, the baud rate up to 3.6Mbps. the communication baud rate including: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200(default), 230400, 460800, 921600, 1842000, 3686400bps.
- Support both RS232 modem and Simple modem connections.
- Support Hardware flow control.
- Support Auto baud rate synchronize.

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3 Hardware Interface

SIMCom modules designed as a DCE (Data Communication Equipment). It provides a Simple or RS232 modem which is used for data transmission and sending AT commands.

The default baud rate is 115200bps, data size is 8 bits, stop bits is 1 bit, and parity is none. The default connection is RS232 modem.

3.1 Description of related PIN

Table 1: Pin description

PIN type	PIN name	I/O	Active voltage	Default Status
UART	UART_RXD	I	High/Low	Pull- Up
	UART_TXD	O	High/Low	Pull-Up
	UART_RTS	O	High/Low	Pull-Up
	UART_CTS	I	High/Low	Pull-Up
	UART_DTR	I	High/Low	Pull-Up
	UART_DCD	O	High/Low	Pull-Up
	UART_RI	O	High/Low	Pull-Up

Table 2: Logic level

Parameter	Min	Max	Unit
Logic low input	-0.3	0.3	V
Logic high input	0.8	1.83	V
Logic low output	-0.3	0.3	V
Logic high output	0.9	1.83	V

3.2 Connect to Host

1) Simple modem

When the module is used as a simple modem/null modem for data transmission, only RXD and TXD signal PIN are used, the following figure shows the connection between A76XX module and DTE(customer's CPU).

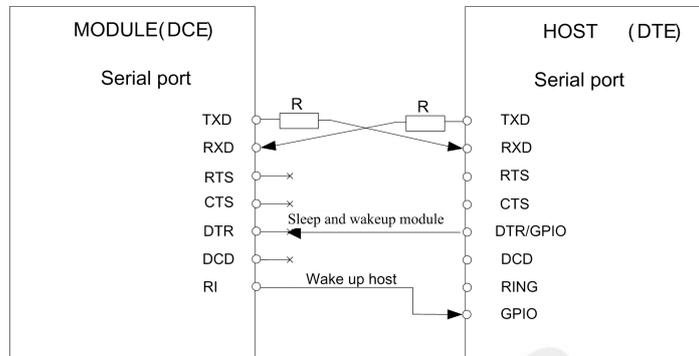


Figure 1: Simple modem

2) RS232 modem

When the module is used as a RS232 modem for data transmission, all the signal PIN should be connected, including TXD, RXD, RTS, CTS, DTR, DCD and RI, and the corresponding PIN should be configured as UART function, the details please refer to the Control Signals section below. The following figure shows the connection between A76XX module and DTE (customer's CPU).

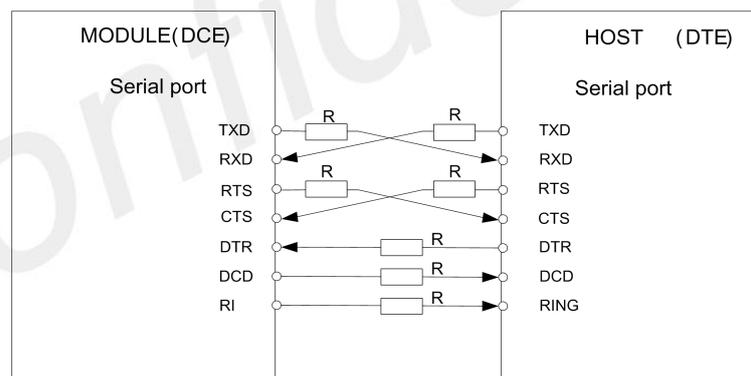


Figure 2: RS232 modem

NOTE

- For different devices, the name of RTS PIN maybe confused as CTS PIN, and the name of CTS PIN maybe confused as RTS PIN, the I/O direction of A76XX module's CTS PIN is IN, and RTS PIN is OUT, user can determine this confusion by the I/O direction.
- For the specific design or circuit diagram (you can consider the specific situation), please refer

to the hardware design document (A76XXC1_Hardware Design Manual_V1.01)

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4 Control PIN Description

4.1 CTS

When this pin is in hardware flow control mode, this signal is asserted (low level) to prepare the module (DCE) for accepting transmitted data from the DTE device.

DCE stop transmitting data if CTS PIN is high level, transmission begins or continues if CTS is low level, if CTS goes high in the middle of character transmission, the module (DCE) waits for a completed transmission before stop transmitting data.

This PIN is in GPIO mode by default, user can switch to flow control mode by “AT+IFC=2,2” command.

4.2 RTS

When this pin is in hardware flow control mode, this signal is asserted by the module (DCE) to inform the DTE device that transmission may begin.

The RTS PIN output high level when the RX FIFO level of the module (DCE) is the same or greater than 64, when the Rx FIFO level falls below 64 the RTS PIN output low level.

This PIN is in GPIO mode by default, user can switch to flow control mode by “AT+IFC=2,2” command.

4.3 DCD

AT command AT&C can be used to set DCD function mode. When set “AT&C0”, DCD line is always ON (low). When set “AT&C1”, DCD line is ON (low) only in the presence of data carrier. When set “AT&C2”, setting the DCD line be on just 1 second after the data calls end.

4.4 DTR

The PIN default in GPIO mode, and support sleep/wakeup mode, AT command AT+CSCLK can be used to switch GPIO and sleep/wakeup mode. If DTR in Sleep mode, module will be in sleep mode when it not have any work.

AT+CSCLK=0 set to GPIO mode.

AT+CSCLK=1 set to Sleep/Wakeup mode, then module enter sleep mode when DTR pin pulled up; module will be waked up when DTR pin pulled down.

NOTE

- If module coming call when in sleep mode, it will be waked up and send URC to host, module will be auto sleep when URC send complete and DTR is high then sleep time.
- Anytime host want send data to module, it must be pull down DTR then 20ms.

4.5 RI

This PIN is used wakeup host when module have message to the port, message can support Call, SMS or URC. If want to get more contents, please refer to **A76XX Series_Sleep Mode_Application Note**.

State	RI respond
Standby	HIGH
Voice/Data call	Change to LOW, then: <ul style="list-style-type: none"> ● Change to HIGH when call is established. ● Use AT command ATH, the RI PIN is changed to HIGH. ● Sender hangs up, change to HIGH. ● SMS received.
SMS	When receiving SMS, the RI PIN will be changed to LOW level for about 120ms, and then it is changed to HIGH level.
URC	When receiving URC, the RI PIN will be changed to LOW level for about 60ms, and then it is changed to HIGH level.

5 Related Function

5.1 Flow Control

Flow control is very important during the transmission (large data) between the module (DCE) and the terminal device (DTE). When the receiving buffer reaches its capacity, the receiving device should be capable of pause the sending device until it overflows. A76XX series modules are designed as no flow control by default, but use can enable this function by AT command.

Hardware flow control achieves the data flow control by controlling the RTS/CTS line which follows the RS232 standard. The command "AT+IFC=2, 2" can be used to enable hardware flow control, these setting are stored automatically.

To achieve hardware flow control, ensure that the RTS/CTS lines are present on user's application platform.

5.2 Multiplex

Before using the multiplexer of module, one should also implement the same function on one's own side, currently the multiplexer resided in the module is conformed to the specification of GSM07.10 so one can implement his own multiplexer followed by this specification.

In a word one must implement his own multiplexer first at his side before rightly using SIMCOM module's multiplexer.

Currently the module only supports Basic mode and one byte length indicator, AT+CMUX=0 can make four virtual ports, there are ports only support AT service.

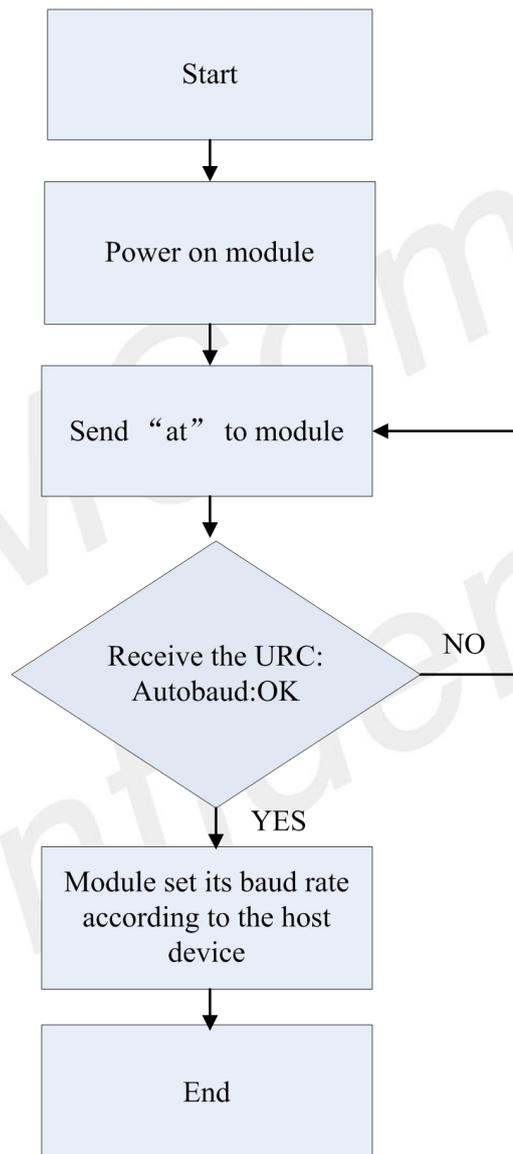
5.3 Synchronize baud rate

Although the standard A76XX series module doesn't support this function by default, user can use AT+IPR or +IPREX command to set auto baud rate.

Auto baud rate allows A76XX series module to automatically detect the baud rate based on the host device. Host device must to synchronize the baud rate with A76XX series module first before use. Host must send

“at” string to synchronize the module, if module matches the baud rate it will response with URC: “OK”, if no URC reported host must send the synchronize string again until the URC received. If the baud rate is matched between the module and host device, two devices can communicate with each other normally. The function is supported in +IPR or +IPREX.

When IPREX or IPR is set to 0, auto baud rate is activated.If TA send “AT+IPREX=0” command to modem, then module will be save auto baud rate mode.



Baud rate synchronization chart