



A76XX Series_ Dual SIM _Application Note

LTE Module

SIMCom Wireless Solutions Limited

SIMCom Headquarters Building, Building 3, No. 289 Linhong
Road, Changning District, Shanghai P.R. China

Tel: 86-21-31575100

Support: support@simcom.com

www.simcom.com

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SIMCom Wireless Solutions Limited

SIMCom Headquarters Building, Building 3, No. 289 Linhong Road, Changning District, Shanghai P.R. China
Tel: +86 21 31575100
Email: simcom@simcom.com

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About Document

Version History

Revision	Date	Author	Description
V1.00	2022.05.30	Sijin.zhou Yannan.sun	New version
V1.01	2022.07.25	Bobo.shao	Modified 3.3.1 Description: The AT channel of the modem port is changed with the main card Delete Q&A section "SIM2 PPP dial-up failure"
V1.02	2023.06.13		Update the scope of the document

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Scope

Based on module AT command manual, this document will introduce Dual SIM application process. Developers could understand and develop application quickly and efficiently based on this document. This document applies to ASR CTA1 Series, A1603 Series, A1606 Series.

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Contents

About Document	2
Version History	2
Scope	3
Contents	4
1 Introduction	5
1.1 Purpose of the document	5
1.2 Related documents	5
1.3 Conventions and abbreviations	5
2 Basic Knowledge of DS	6
3 DS Application	7
3.1 DS Mode Selection	7
3.1.1 DUAL SIM DUAL STANDBY FP	7
3.1.2 DUAL SIM DUAL STANDBY	7
3.1.3 DUAL SIM SINGLE STANDBY	7
3.2 Master SIM Selection	8
3.3 Bind AT command channel and URC reporting	10
3.3.1 Bind AT command channel	10
3.3.2 URC reporting control	11
3.3.3 Data service URC on DS	13
3.3.4 List of URC with suffix “DS”	13
4 Example	14
4.1 Basic DS configuration	14
4.2 URC reporting when power up	14
4.3 URC reporting on CS service	15
4.4 URC reporting on PS service	17
Q&A	19

1 Introduction

1.1 Purpose of the document

This document will describe how to design with Dual SIM(DS for short) function from software side. With this document customer will learn about the DS feature and apply to customer application.

1.2 Related documents

- [1] A76XX Series_AT Command Manual
- [2] A1602 & 1606 Series_AT Command Manual

1.3 Conventions and abbreviations

In this document, the GSM engines are referred to as following term:

ME (Mobile Equipment);

MS (Mobile Station);

TA (Terminal Adapter);

DCE (Data Communication Equipment) or facsimile DCE (FAX modem, FAX board);

In application, controlling device controls the GSM engine by sending AT Command via its serial interface.

The controlling device at the other end of the serial line is referred to as following term:

TE (Terminal Equipment);

DTE (Data Terminal Equipment) or plainly "the application" which is running on an embedded system;

Other Conventions:

DS(Dual-SIM);

DSDS(dual-SIM dual standby);

CS(Circuit Switching);

PS(Packet switching);

URC(Unsolicited result code);

IMEI(International Mobile Equipment Identity);

2 Basic Knowledge of DS

A76XX series of module could support DS feature with DSDS(Dual SIM Dual Standby) or DSSS(Dual SIM Single Standby) configuration by AT command, the operation and behavior of the 2 SIM cards is independent. The 2 SIM cards could communicate with network in parallel(when in idle mode), meaning they can register to different operator,do cell selection\re-selection\paging at the same time. But the module could only run CS\PS service with only 1 selected card at a time while for the other card it must be in not connected or idle mode.For example when SIM1 is on a voice call,SIM2 can not accept incoming call and caller to SIM2 will get “busy” or “not available” at the moment, only after SIM1 finish the call, then SIM2 could start CS service(voice call and SMS).In the same way only a selected card will act as master SIM to provide data service while the other vice SIM could not have ability to provide data service.

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3 DS Application

3.1 DS Mode Selection

3.1.1 DUAL SIM DUAL STANDBY FP

With this mode, the module will register network for both SIM cards. The master SIM will register ims service(if card supported), and the vice SIM will register ims service too(if card supported)

3.1.2 DUAL SIM DUAL STANDBY

With this mode,the module will register network for both SIM cards. The master SIM will register ims service(if card supported), and the vice SIM will not register ims service. If the vice card does not support 2G or the module is CAT-1 only, then there will be no CS service(voice call and SMS will not be supported).

3.1.3 DUAL SIM SINGLE STANDBY

With this mode,the module will only register network for master SIM,the vice SIM will be in flight mode.

The following AT command could be used to configure the DS mode.

AT+DUALSIM Set dual-sim mode

Test Command AT+DUALSIM=?	Response +DUALSIM: (0: DUAL SIM DUAL STANDBY, 1: DUAL SIM SINGLE STANDBY, 3: DUAL SIM DUAL STANDBY FP)
Read Command AT+DUALSIM?	Response +DUALSIM: <dsmode>
Write Command AT+DUALSIM=<dsmode>	Response 1)If the parameter is correct, response: OK 2)Others: ERROR

Parameter Saving Mode	AUTO_SAVE
Max Response Time	9000ms
Reference	

Defined Values

<dsmode>	Integer type
	0 Dual SIM dual standby
	1 Dual SIM single standby
	3 Dual SIM dual standby with extras(Default setting)

Examples

AT+DUALSIM=?

+DUALSIM: (0: DUAL SIM DUAL STANDBY, 1:
DUAL SIM SINGLE STANDBY, 3: DUAL SIM
DUAL STANDBY FP)

OK

AT+DUALSIM?

+DUALSIM: 0

OK

AT+DUALSIM=0

OK

3.2 Master SIM Selection

A76XX series only support single channel of data service processor,so only one SIM could act as master SIM to provide data service(SIM1 as default setting),there is AT command for customer to select master SIM(command setting could be kept in NV ROM). But to keep the stability of module usage, if single card has been inserted,this card will act as master SIM regardless of the setting by AT command. Changing master SIM to a different card will lose all previous running CS\PS service.

The following AT command could be used to select the master SIM.

AT+SWITCHSIM Switch master SIM	
Test Command AT+SWITCHSIM=?	Response +SWITCHSIM: (0: SIM1, 1: SIM2) OK
Read Command AT+SWITCHSIM?	Response +SWITCHSIM: <simID> OK
Write Command AT+SWITCHSIM=<simID>	Response 1)If the parameter is correct,and the corresponding card has been inserted, response: OK 2)Others: ERROR
Parameter Saving Mode	AUTO_SAVE
Max Response Time	9000ms
Reference	

Defined Values

<simID>	Integer type 0 SIM1 1 SIM2
---------	----------------------------------

Examples

```
AT+SWITCHSIM=?
+SWITCHSIM: (0: SIM1, 1: SIM2)
```

```
OK
AT+SWITCHSIM?
+SWITCHSIM: 0
```

```
OK
AT+SWITCHSIM=1
OK
```

3.3 Bind AT command channel and URC reporting.

A76XX series has only 1 AT command channel internally, to handle dual SIM the module need to switch different logic channel for different SIM. For AT command channel bind there is AT+BINDSIM command to select SIM, further AT command send will be fixed to selected SIM card. For URC reporting there is AT+DUALSIMURC command to configure the ability for SIM1 and SIM2.

3.3.1 Bind AT command channel

To ensure that the 2 SIM are controllable and do not affect each other, the AT command takes effect on only one selected SIM. For example as default SIM1 is binding channel, all functions of AT commands sent by users through the default bound channel are only effective for SIM1 card, and SIM2 card is not affected by them. If you need to independently control or query the function status of SIM2 card, you need to use the AT command to bind the channel in use to SIM2 card. In this case, the channel will give up the control of SIM1 card and only control SIM2 card. It should be noted that binding channels only affects the control right of AT and does not affect URC reporting. For details on URC reporting, see 3.3.2.

Note: After the main card is switched, in order to use the PPP dial-up service more conveniently, the AT channel of the Modem port will be automatically bound to the main card.

The following AT command could be used to bind AT command channel.

AT+BINDSIM Bind ATP to SIM1 or SIM2	
Test Command AT+BINDSIM=?	Response +BINDSIM: (0: SIM1, 1: SIM2) OK
Read Command AT+BINDSIM?	Response +BINDSIM: <simID> OK
Write Command AT+BINDSIM=<simID>	Response 1)If the parameter is correct, response: OK 2)Others: ERROR
Parameter Saving Mode	NO_SAVE
Max Response Time	9000ms
Reference	

Defined Values

<simID>	Integer type
0	SIM1
1	SIM2

Examples

AT+BINDSIM=?

+BINDSIM: (0: SIM1, 1: SIM2)

OK

AT+BINDSIM?

+BINDSIM: 0

OK

AT+BINDSIM=0

OK

AT+CIMI

460003064859756

OK

AT+BINDSIM=1

OK

AT+CIMI

460012360528428

OK

3.3.2 URC reporting control

In order to distinguish dual SIM reporting and avoid dual SIM URC confusion, only the URC information of SIM1 card will be reported in the factory default channel, and the URC information of SIM2 card will be shielded by default. You can select the URC switch of a certain SIM card through the AT command, or turn on the URC of two cards AT the same time to report. When the URC switch of SIM2 card is turned on (AT+DUALSIMURC=1/2), the suffix "DS" is added to part of the URC of SIM2 card for differentiation (see 3.3.4 for details), which is valid for all channels, including CMUX. Such as:

SIM1 Call URC: RING

SIM2 Call URC: RINGDS

The following AT command could be used to configure URC reporting switch.

AT+DUALSIMURC Dual card reporting control

Test Command AT+DUALSIMURC=?	Response +DUALSIMURC: (0:SIM1, 1:SIM2, 2:SIM1&SIM2) OK
Read Command AT+DUALSIMURC?	Response + DUALSIMURC: <opt> OK
Write Command AT+DUALSIMURC =<opt>	Response 1)If the parameter is correct, response: OK 2)Others: ERROR
Parameter Saving Mode	AUTO_SAVE
Max Response Time	9000ms
Reference	

Defined Values

<opt>	Integer type 0 SIM1---Only output URC from SIM1 1 SIM2---Only output URC from SIM2 2 SIM1 & SIM2---Output URC from SIM1&SIM2 Note: URC for SIM2 will add "DS" in the end of string.
--------------------	---

Examples

```

AT+DUALSIMURC=?
+DUALSIMURC: (0:SIM1, 1:SIM2, 2:SIM1&SIM2)

OK
AT+DUALSIMURC?
+ DUALSIMURC: 0

OK
AT+ DUALSIMURC=1
OK

```

3.3.3 Data service URC on DS

Based on the description of primary card switching in Section 3.2 , it can be seen that due to the single AT command channel design, the current data service of the module can only be carried by the primary card dial-up. Therefore, the URC reported for data service operation will not add the suffix "DS" and only needs to be checked by AT+SWITCHSIM? so that the URC card source can be distinguished by querying the current master SIM number. Any data service operation is not affected by AT+BINDSIM. In other words, all data business interaction objects are master cards. The data services include TCP, FTP, HTP, HTTP, MQTT, NTP, PING, and SSL.

3.3.4 List of URC with suffix "DS"

SIM1 URC	SIM2 URC
SMS DONE	SMS DONEDS
PB DONE	PB DONEDS
SMS FULL	SMS FULLDS
RING	RINGDS
NO CARRIER	NO CARRIERDS
+CPIN	+CPINDS
*ATREADY	*ATREADYDS
+CCWA	+CCWADS
+CLCC	+CLCCDS
+CLIP	+CLIPDS
+COLP	+COLPDS
+CREG	+CREGDS
+CGREG	+CGREGDS
+CEREG	+CEREGDS
+CMTI	+CMTIDS
+CMT	+CMTDS
+CDS	+CDSDS
+MSTK	+MSTKDS
+CUSD	+CUSDDDS
+CGEV	+CGEVDS
+SIMCARD	+SIMCARDDS
VOICE CALL	VOICE CALLDS
+CDSI	+CDSIDS
+CBM	+CBMDS
+CRING	+CRINGDS

4 Example

4.1 Basic DS configuration

AT+DUALSIM?	Check DS mode
+DUALSIM: 3	Dual SIM Dual Standby with extras
OK	
AT+SWITCHSIM?	Check master SIM
+SWITCHSIM: 0	SIM1 as mater SIM with default setting
OK	
AT+BINDSIM?	Check binding AT command channel
+BINDSIM: 0	SIM1 as binding channel
OK	
AT+CSPN?	Check registered operator
+CSPN: "CMCC",1	SIM1 registered to CMCC
OK	
AT+BINDSIM=1	Change binding AT command channel to SIM2
OK	
AT+BSPN?	Check registered operator
+CSPN: "China Telecom",1	SIM2 registered to China Telecom
OK	

4.2 URC reporting when power up

AT+DUALSIMURC?	Check URC switch setting
+DUALSIMURC: 0	URC reporting only for SIM1 as default setting
OK	
+CPIN: READY	Reboot module,URC reporting for SIM1

+CGEN: EPS PDN ACT 1

SMS DONE

PB DONE

AT+DUALSIMURC=2

Changing URC switch

OK

+CPIN: READY

Reboot module, URC reporting for both SIM1 and SIM2, for SIM2 the URC with "DS"

+CPINDS: READY

*ATREADY: 1

*ATREADYDS: 1

PB DONE

SMS DONE

+CGEVDS: EPS PDN ACT 1

PBDS DONE

SMSDS DONE

4.3 URC reporting on CS service

Voice call:

AT+BINDSIM?

Check binding AT command channel

+BINDSIM: 0

Bind to SIM1

OK

AT+DUALSIMURC=2

Enable URC for SIM1 and SIM2

OK

AT+BINDSIM=1

Bind to SIM2

OK

ATD18412345678;

Make voice call from SIM2, URC reporting for SIM2

+CGEVDS: NW ACT 8,10

OK

+CLCCDS: 1,0,2,0,0,"18412345678",129,""

+CLCCDS: 1,0,3,0,0,"18412345678",129,""

VOICE CALLDS: BEGIN

+CLCCDS: 1,0,0,0,0,"18412345678",129,""

+COLPDS: "18412345678",129

AT+CHUP

Hung up call

+CGEVDS: NW DEACT 8,10

NO CARRIERDS

+CLCCDS: 1,0,6,0,0,"18468070411",129,""

OK

VOICE CALLDS: END: 000010

+CGEVDS: NW ACT 8,10

RINGDS

+CLIPDS: "18468070411",129

+CLCCDS: 1,1,4,0,0,"18468070411",129,""

ATA

Answer call

VOICE CALLDS: BEGIN

+CLCCDS: 1,1,0,0,0,"18468070411",129,""

OK

AT+CHUP

Hung up call

+CGEVDS: NW DEACT 8,10

NO CARRIERDS

+CLCCDS: 1,1,6,0,0,"18468070411",129,""

VOICE CALLDS: END: 000011

OK

NOTE

Only one SIM card can initiate the voice call service at a time. The SIM card must be the same as the control right of the current binding AT channel when you use or hang up the call service. Otherwise, the command will be invalid.

SMS:

AT+CCNMI=2,1,0,0,0	Set new SMS URC indicator
OK	
+CMTI: "SM",1	URC for new SMS on SIM1
+CMTIDS: "SM",1	URC for new SMS on SIM2
AT+CNMI=1,2,0,0,0	Set new SMS URC indicator with text output to UART
OK	
+CMT: "+8618325007055", "", "22/05/29,14:20:05+32"	URC for new SMS on SIM1
1234	
+CMTDS: "+8618325007055", "", "22/05/29,14:20:05+32"	URC for new SMS on SIM2
1234	

4.4 URC reporting on PS service

AT+SWITCHSIM?	Check master SIM
+SWITCHSIM: 0	SIM1 as master SIM
OK	
AT+BINDSIM=0	Bind to SIM1

OK

AT+CGPADDR

Check IP for SIM1

+CGPADDR: 1,10.60.78.57

OK

AT+BINDSIM=1

Bind to SIM2

OK

AT+CGPADDR

Check IP for SIM2

+CGPADDR: 1,10.60.20.48

OK

AT+CPING="8.8.8.8",1,3,10,1000

SIM1 as master SIM to PING 8.8.8.8

OK

+CPING: 1,8.8.8.8,38,55,49

+CPING: 1,8.8.8.8,38,45,49

+CPING: 1,8.8.8.8,38,45,49

+CPING: 3,3,3,0,45,55,48

AT+SWITCHSIM=1

Change master SIM to SIM2

OK

AT+CPING="8.8.8.8",1,3,10,1000

SIM1 as master SIM to PING 8.8.8.8

+CPING: 1,8.8.8.8,38,110,114

+CPING: 1,8.8.8.8,38,115,114

+CPING: 1,8.8.8.8,38,100,114

+CPING: 3,3,3,0,100,115,108

Q&A

Q: Why can not read second IMEI and get ERROR?

A: ERROR means there is no second IMEI inside module, you need to check if you are using correct hardware PN as only DS hardware version has second IMEI. Please note in some case if there is no second IMEI the registration on second SIM will fail. For test purpose customer could use AT+BINDSIM=1 and AT+SIMEI=xxx to write a temp second IMEI.

Q: Why AT+SWITCHSIM=0/1 returns ERROR?

A: (1) Please check if the selected SIM card has been inserted well, usually it is hardware connection issue.
(2) Please check with AT+SWITCHSIM? if current setting has already been configured, same configuration will cause ERROR.

Q: Why after AT+SWITCHSIM=0 or 1 to change master, some AT command can not be used and return ERROR?

A: Switching master will take few seconds, please wait at least 5 seconds then send AT command especially for network related AT commands.