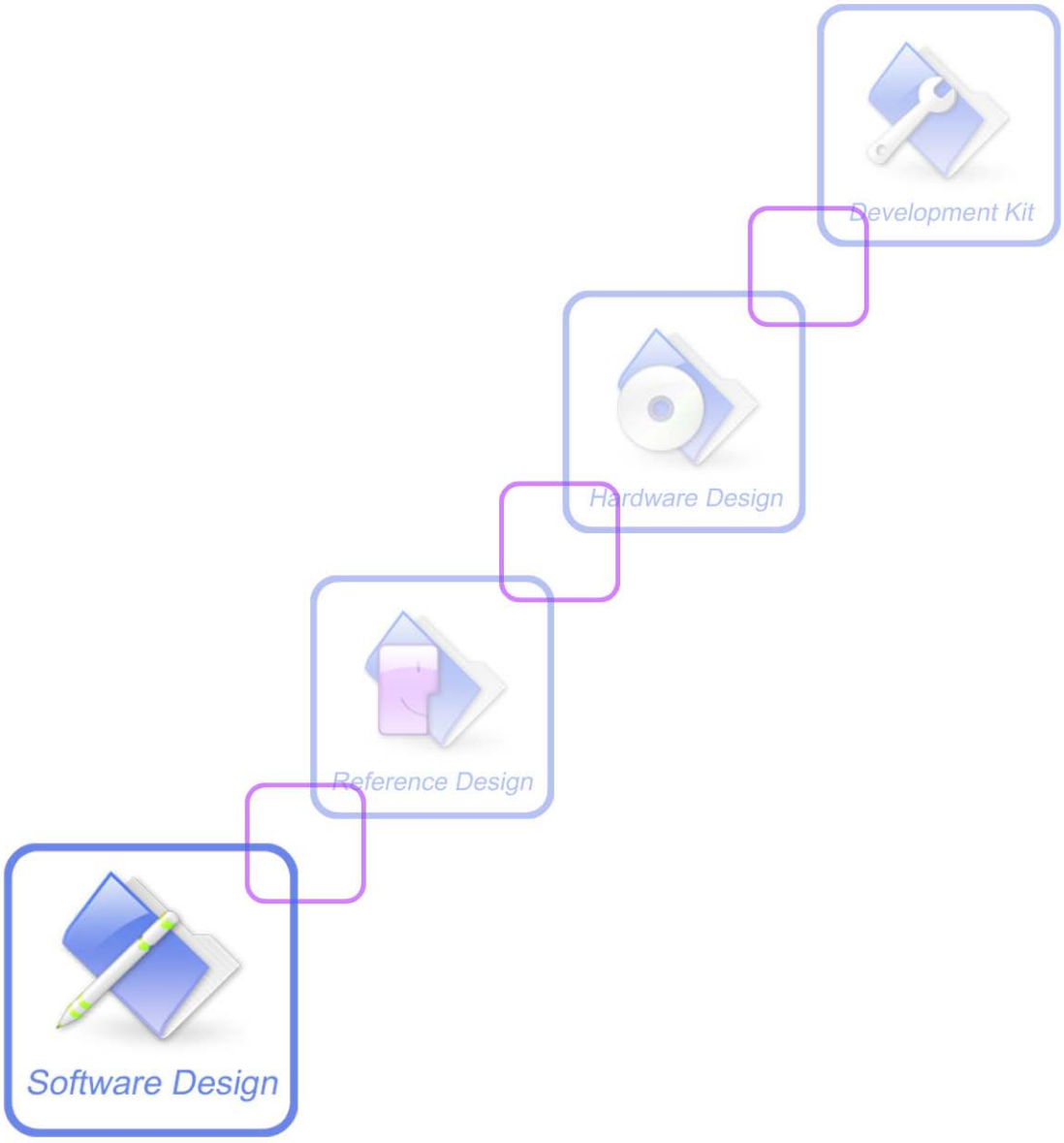
SIM7100 CSD Application Note



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Version History

Version	Chapter	Comments
V0.01	New Version	

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CSD Application Note

1. Introduction

1.1 Overview

This document gives the usage of CSD data call functions. Users can get useful information about the function quickly through this document.

Circuit Switched Data (CSD) is the original form of data transmission developed for mobile phone systems like GSM and WCDMA. A CSD call functions in a very similar way to a normal voice call.

SIM7100 CSD features:

- Supports data rates up to 64kbps.
- Supports Both Synchronous/transparent and Asynchronous/nontransparent
- Supports CSD call status query/URC.

1.2 References

The present document is based on the following documents:

[1] SIMCOM_SIM7100_ATC_EN_V0.01.pdf

1.3 Terms and Abbreviations

For the purposes of the present document, the following abbreviations apply:

- AT ATtention; the two-character abbreviation is used to start a command line to be sent from TE/DTE to TA/DCE
- CSD Circuit Switched Data
- GSM Global system for mobile communications
- WCDMA Wideband code division multiple access
- RLP Radio Link Protocol
- URC Unsolicited Result Code

2. CSD Call Setting

The purpose of this section is to help get you start with CSD setting.

2.1 CSD mode

The SIM7100 module supports CSD and video call over CSD function, so if you want use CSD function to transfer data in stand of using integrated video call function, you should use AT+VPSM=1 command to switch off video call function.

The SIM5320/SIM5310 module support CSD data call only, does not supports video call over CSD function, so the CSD mode is default mode

2.2 Select bearer service type

Following table show the supported CSD bearer service type:

+CBST Setting	Radio Access		Information Transfer Capability				Rate Adaption					Sync/Async	Trans/NTrans	FNUR[kbps]	WAIUR[kbps]	Modem Type	V.42 Data Compression	Comment
	GSM	UMTS	3.1kHz	UDI	RDI	Fax	V.110	V.120	X.31FS	H.223/H.245	None							
134,1,0		v		v						v		S	T	64.0	Undef	None		Multimedia
116,1,0		v		v							v	S	T	64.0	Undef	None		Bit Transparent
7,1,0	v		v			v					v	A	T	Undef	Undef	None		Group3 Class1
84,0,1		v		v					v			A	NT	64.0	57.6	None	v	Frame Tunneling Mode (FTM)
83,x,1		v		v	v				v			A	NT	56.0	57.6	None	v	FTM, x: 0=UDI, 4=RDI
81,0,1		v		v			v					A	NT	38.4	57.6	None	v	
80,0,1		v		v			v					A	NT	28.8	28.8	None	v	
75,0,1	v	v		v			v					A	NT	14.4	14.4	None	v	
71,0,1	v			v			v					A	NT	Undef	Undef	None	v	
51,0,1		v		v				v				A	NT	56.0	57.6	None	v	
48,0,1		v		v				v				A	NT	28.8	28.8	None	v	
43,0,1	v	v		v				v				A	NT	14.4	14.4	None	v	
39,0,1	v			v				v				A	NT	Undef	Undef	None	v	
17,0,1		v	v								v	A	NT	33.6	57.6	V.34	v	
16,0,1		v	v								v	A	NT	28.8	28.8	V.34	v	
14,0,1	v	v	v								v	A	NT	14.4	14.4	V.34	v	
12,0,1	v		v								v	A	NT	9.6	9.6	V.34	v	
7,0,1	v		v								v	A	NT	Undef	Undef	V.34	v	
0,0,1		v	v								v	A	NT	NA	57.6	AutoBaud	v	
0,0,1	v		v								v	A	NT	9.6	Undef	AutoBaud	v	

The CSD should support by operator network, please contact the operator for supported feature.

Synchronous/transparent bearers ensure constant throughput but are best effort for frame transmission so some data loss is expected. This configuration is used for video telephony call on WCDMA and facsimile on GSM. Asynchronous/nontransparent bearers ensure reliable data transmission via Reliable Link Protocol RLP which is an implementation of the classic Sliding Window protocol. This configuration is used for data transfer on both GSM and WCDMA.

For example:

◆ If user want to implement video call use 64kbps CSD channel, the suggested configuration is:

AT+CBST=134,1,0

3. CSD Call Control

The CSD call control and the state monitor are basically the same as voice calls.

3.1 CSD call Origination

User can originate a CSD data call by ATD command, the termination character ':' should not be used.

3.2 CSD call Hang up

User can hang up a CSD data call by ATH command or drop DTR pin.

3.3 CSD call Incoming

When there is a CSD call incoming, the RING/CRING URC should received by user. In order to distinguish between voice call and data call, send command AT+CRC=1 to enable the extended format of incoming call indication.

3.4 CSD call status

User can query the CSD call state by AT+CLCC command, or enable the +CLCC URC by setting AT+CLCC=1 command.

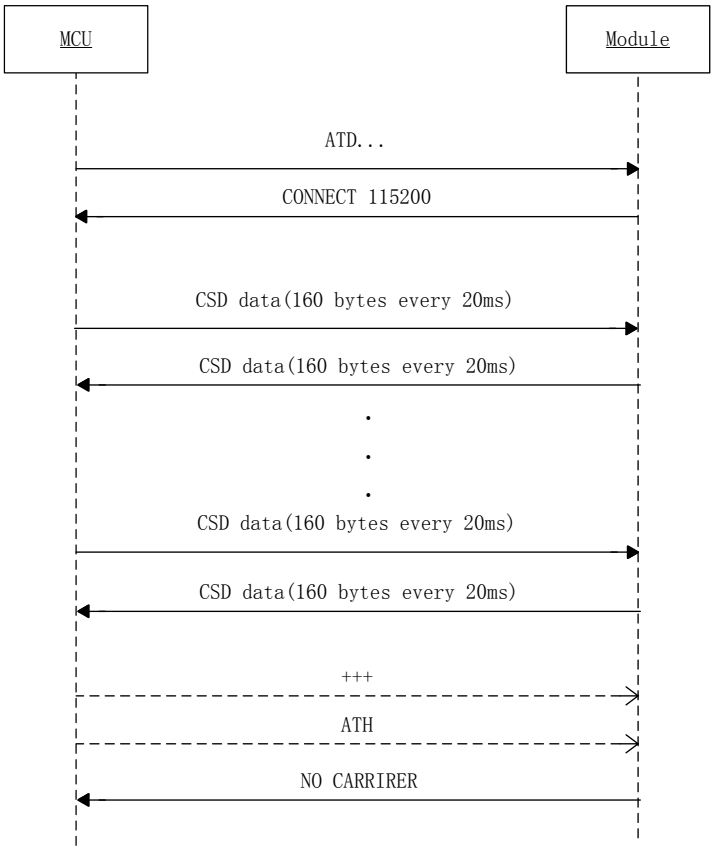
Note that if the CSD data call is in transparent mode, the COM port (ATD or ATA command send to) used by CSD is enter data mode, the AT command should not send to COM port when it's in data mode, in such case, there are two methods to send AT command:

- Use +++ and ATO command to switch between data mode and command mode.
- Send AT command via another COM port.

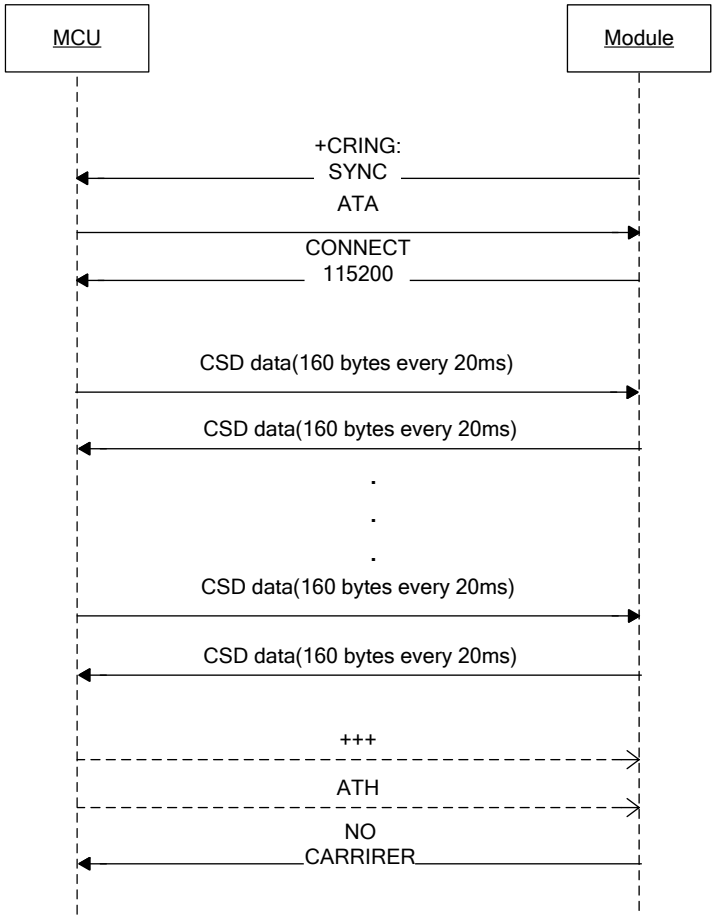
4. CSD Call Follow

We use 64kbps CSD call for example in following flowchart, the bearer service type is setup by AT+CBST=134,1,0

4.1 MO Call


MCU
Module
ATD...
CONNECT 115200
CSD data(160 bytes every 20ms)
CSD data(160 bytes every 20ms)
CSD data(160 bytes every 20ms)
CSD data(160 bytes every 20ms)
+++
ATH
NO CARRIRER

4.2 MT Call



5. Typical Samples

AT+CRC=1
OK
AT+CBST=134,1,0
OK
+CRING: SYNC +CRING: SYNC
AT+CLCC
+CLCC: 1,1,4,1,0,"18602102222",128

OK
ATH
OK
+CRING: SYNC +CRING: SYNC
AT+CLCC
+CLCC: 1,1,4,1,0,"18602102222",128 OK
ATA
CONNECT 115200
… …
+++
OK
… …
ATH
OK
ATD18602102222
CONNECT 115200
… …
NO CARRIER

6. Q&A

Some frequently asked questions may be helpful for using CSD.

In 64kbps CSD mode, why the peer can not receive data when data send to COM port successful?

Data will be buffered in module when there is no more than 80 bytes, so we recommend that sending data in multiples of 80 bytes.

In some cases, you should add some padding data, for example, remaining undelivered data length of the file is less than 80 bytes.

We use 64kbps CSD to implement video call function, if we need to reverse the bit order of receiving/send data?

The data received/sent from/to our module is in the same bit order; you may need to reverse bit order according your video call protocol.

You can use table look-up method to achieve the bit order reverse before sending data and after receiving

data, e.g.

```
BYTE reflect[] = {
    0x00, 0x80, 0x40, 0xc0, 0x20, 0xa0, 0x60, 0xe0, 0x10, 0x90, 0x50, 0xd0, 0x30, 0xb0, 0x70, 0xf0,
    0x08, 0x88, 0x48, 0xc8, 0x28, 0xa8, 0x68, 0xe8, 0x18, 0x98, 0x58, 0xd8, 0x38, 0xb8, 0x78, 0xf8,
    0x04, 0x84, 0x44, 0xc4, 0x24, 0xa4, 0x64, 0xe4, 0x14, 0x94, 0x54, 0xd4, 0x34, 0xb4, 0x74, 0xf4,
    0x0c, 0x8c, 0x4c, 0xcc, 0x2c, 0xac, 0x6c, 0xec, 0x1c, 0x9c, 0x5c, 0xdc, 0x3c, 0xbc, 0x7c, 0xfc,
    0x02, 0x82, 0x42, 0xc2, 0x22, 0xa2, 0x62, 0xe2, 0x12, 0x92, 0x52, 0xd2, 0x32, 0xb2, 0x72, 0xf2,
    0x0a, 0x8a, 0x4a, 0xca, 0x2a, 0xaa, 0x6a, 0xea, 0x1a, 0x9a, 0x5a, 0xda, 0x3a, 0xba, 0x7a, 0xfa,
    0x06, 0x86, 0x46, 0xc6, 0x26, 0xa6, 0x66, 0xe6, 0x16, 0x96, 0x56, 0xd6, 0x36, 0xb6, 0x76, 0xf6,
    0x0e, 0x8e, 0x4e, 0xce, 0x2e, 0xae, 0x6e, 0xee, 0x1e, 0x9e, 0x5e, 0xde, 0x3e, 0xbe, 0x7e, 0xfe,
    0x01, 0x81, 0x41, 0xc1, 0x21, 0xa1, 0x61, 0xe1, 0x11, 0x91, 0x51, 0xd1, 0x31, 0xb1, 0x71, 0xf1,
    0x09, 0x89, 0x49, 0xc9, 0x29, 0xa9, 0x69, 0xe9, 0x19, 0x99, 0x59, 0xd9, 0x39, 0xb9, 0x79, 0xf9,
    0x05, 0x85, 0x45, 0xc5, 0x25, 0xa5, 0x65, 0xe5, 0x15, 0x95, 0x55, 0xd5, 0x35, 0xb5, 0x75, 0xf5,
    0x0d, 0x8d, 0x4d, 0xcd, 0x2d, 0xad, 0x6d, 0xed, 0x1d, 0x9d, 0x5d, 0xdd, 0x3d, 0xbd, 0x7d, 0xfd,
    0x03, 0x83, 0x43, 0xc3, 0x23, 0xa3, 0x63, 0xe3, 0x13, 0x93, 0x53, 0xd3, 0x33, 0xb3, 0x73, 0xf3,
    0x0b, 0x8b, 0x4b, 0xcb, 0x2b, 0xab, 0x6b, 0xeb, 0x1b, 0x9b, 0x5b, 0xdb, 0x3b, 0xbb, 0x7b, 0xfb,
    0x07, 0x87, 0x47, 0xc7, 0x27, 0xa7, 0x67, 0xe7, 0x17, 0x97, 0x57, 0xd7, 0x37, 0xb7, 0x77, 0xf7,
    0x0f, 0x8f, 0x4f, 0xcf, 0x2f, 0xaf, 0x6f, 0xef, 0x1f, 0x9f, 0x5f, 0xdf, 0x3f, 0xbf, 0x7f, 0xff
};
for(i = 0; i < 160; i++) {
    buffer[i] = reflect(buffer[i]);
}
```

How to confirm the CSD data is disconnect?

1. “NO CARRIRER” received indicates the CSD call is disconnect.
2. You can use AT+CLCC command to query the call state in another COM port, or you can use +CLCC URC to determine the call status, please refer to section 3.4 of this document.

Why the command echo is turn on (ATE1) sometimes when the command echo is turn off (ATE0) at the program Initializes?

When the CSD call is disconnected, the COM port exit data mode and enter command mode, the CSD data wrote to COM port may treated as command, and the ATE1 string might just in CSD data, and cause this problem.

We suggest:

1. Upper-layer protocol performs normal disconnecting process, do not send data to COM port when connection is disconnect.
2. Detect COM port CD status change; do not send data to COM Port when there are no carriers.

The CSD data call refuse by peer, we just received a “NO CARRIRER”, is there some method to confirm the call disconnect reason?

You can use AT+CEER command to query the call disconnect reason, more information please refer to our AT commands manual.

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