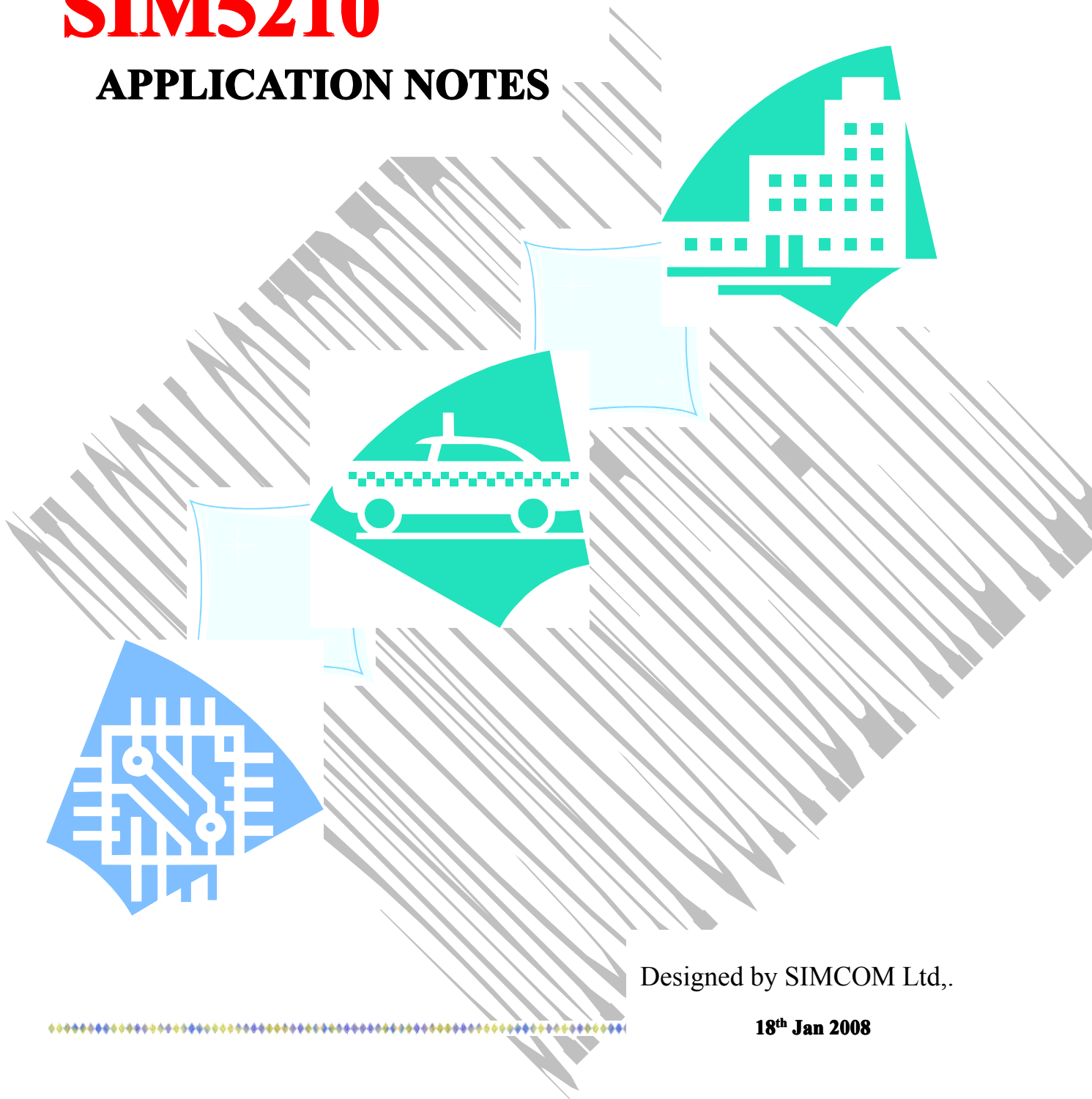


SIM5210

APPLICATION NOTES



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Version history

[illegible]

1 Introduction

This document describes the hardware interface of the SIMCOM SIM5210 module that connects to the specific application and the air interface. As SIM5210 can be integrated with a wide range of applications, all functional components of SIM5210 are described in great detail.

This document can help you quickly understand SIM5210 interface specifications, electrical and mechanical details. With the help of this document and other SIM5210 application notes, user guide, you can use SIM5210 module to design and set-up mobile applications quickly.

1.1 Related documents

Table 1: Related documents

SN	Document name	Remark
[1]	SIM5210_ATC_V01.06	SIM5210_ATC_V01.06
[2]	SIM5210_HD_V01.60	SIM5210 hardware specification
[3]	SIM5210_EVB_UGD_V1.00.pdf	Digital cellular telecommunications (Phase 2+); AT command set for GSM Mobile Equipment (ME)
[4]	SIM5210_MB_P2.0_DL_20080312.pdf	Support GSM 07.10 multiplexing protocol
[4]	SIM5210_DEBUGE_P3.0_070830.pdf	EVB schem

1.2 Terms and abbreviations

Table 2: Terms and abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
ARP	Antenna Reference Point
BER	Bit Error Rate
BTS	Base Transceiver Station
CS	Coding Scheme
CSD	Circuit Switched Data
FR	Full Rate
GMSK	Gaussian Minimum Shift Keying
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HR	Half Rate
IMEI	International Mobile Equipment Identity

Li-Ion	Lithium-Ion
MO	Mobile Originated
MS	Mobile Station (GSM engine), also referred to as TE
MT	Mobile Terminated
PAP	Password Authentication Protocol
FD	SIM fix dialing phonebook
SM	SIM phonebook
NC	Not connect
EDGE	Enhanced data rates for GSM evolution
HSDPA	High Speed Downlink Packet Access
ZIF	Zero intermediate frequency
WCDMA	Wideband Code Division Multiple Access
VCTCXO	Voltage control temperature-compensated crystal oscillator
USIM	Universal subscriber identity module
UMTS	Universal mobile telecommunications system
UART	Universal asynchronous receiver transmitter

2 Product concept

Designed for global market, SIM5210 is a quad-band GSM/GPRS/EDGE and UMTS engine that work on frequencies of GSM 850MHz, EGSM 900 MHz, DCS 1800 MHz, PCS1900 MHz, and UMTS2100MHz. SIM5210 provides GPRS multi-slot class 12/class10/class 8 (optional) capability and EDGE, supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. EDGE: 8 PSK, DTM (class A) multi-slot class 12, DL coding schemes: CS1 ~4, CS1-9, UL coding schemes: CS1 ~4, MCS1-9. SIM5210 also support UMTS HSDPA up to 7.2Mbps

With a tiny configuration of 35mm x 35mm x 4.5 mm, SIM5210 can fit almost all the space requirements in your applications, such as Smart phone, PDA phone and other mobile devices.

The physical interface to the mobile application is made through a 70 pins board-to-board connector, which provides all hardware interfaces between the module and customers' boards except the RF antenna interface.

- Serial port and USB 2.0(full speed) port can be alternatively used as data port.
- USIM interface: support SIM cards: 3V & 1.8V
- Power on/ff and reset signal
- Backup RTC interface.
- Six GPIOs: 1 for interrupt, 1 for flight mode, 1 for status LED, 2 for output control, 1 for input.
- Three audio channels include two microphones inputs and three audio outputs. This can be easily configured by AT command.
- A camera interface is provided.*
- An I2C interface is provided.
- A 4 bit SD card interface is provided.*

***Note: Camera interface and SD card interface functions will be supported by customization software.**

The SIM5210 provides RF antenna interface with two alternatives: antenna connector and antenna pad. The antenna connector is MURATA MM9329-2700. And customer's antenna can be soldered to the antenna pad.

The SIM5210 is integrated with the TCP/IP protocol, Extended TCP/IP AT commands are developed for customers to use the TCP/IP protocol easily, which is very useful for those data transfer applications.

Note:

The SIM5210 have two kinds of interface (UART and USB) to connect to host CPU. USB interface is mapped to 3 virtual UART: "SIMTECH USB Modem", "SIMTECH NMEA Device" and "SIMTECH Diagnostics interface". UART, "SIMTECH USB Modem" and "SIMTECH NMEA Device" could response AT command, normally we recommend UART or "SIMTECH USB Modem" to control SIM5210 module.

SIM5210 key features at a glance:

Table 3: SIM5210 key features

Feature	Implementation
Power supply	Single supply voltage 3.4V – 4.2V
Power saving	Typical power consumption in SLEEP mode to 4.0mA (DRX=2)
Frequency bands	<ul style="list-style-type: none"> ● GSM: 850M/ 900M/ DCS 1800M/ PCS 1900M. ● UMTS: 2100M ● The SIM5210 can worked in GSM and WCDMA mode ● The frequency bands also can be set by AT COMMAND.
Transmit power	<ul style="list-style-type: none"> ● Class 4 (+33dBm ±2dB) for EGSM850 ● Class 4 (+33dBm ±2dB) for EGSM900 ● Class 1 (+30dBm ±2dB) for GSM1800 ● Class 1 (+30dBm ±2dB) for GSM1900 ● Class E2 (+27dBm ± 3dB) for GSM 850 8-PSK ● Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK ● Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK ● Class E2 (+26dBm +3 /-4dB) for GSM 1900 8-PSK ● Class 3 (+24dBm +1.7/-3.7dB) for UMTS 2100, WCDMA FDD BDI
GPRS/EDGE connectivity	<ul style="list-style-type: none"> ● GPRS/EDGE multi-slot is up to class 12 ● GPRS mobile station class B
Temperature range	<ul style="list-style-type: none"> ● Normal operation: -15°C to +55 °C ● Extended operation: -20°C to -15°C and +55 °C to +70 °C <p>GSM,GPRS/EDGE Class 12(2 up): under RF MAXPOWER, operation duration >12 hours</p> <p>WCDMA FDD BDI under <10dBm ,operation duration >12 h</p> <p>WCDMA FDD BDI under RF MAXPOWER ,operation duration <30mins</p> <ul style="list-style-type: none"> ● Storage temperature -40°C to +85°C
DATA <i>GPRS</i> :	<ul style="list-style-type: none"> ● GPRS data downlink transfer: max. 85.6 kbps ● GPRS data uplink transfer: max. 42.8 kbps ● Coding scheme: CS-1, CS-2, CS-3 and CS-4 ● SIM5210 supports the protocols PAP (Password Authentication Protocol) usually

CSD:	<p>used for PPP connections.</p> <ul style="list-style-type: none"> ● The SIM5210 integrates the TCP/IP protocol. ● Support Packet Switched Broadcast Control Channel (PBCCH) ● CSD transmission rates: 2.4, 4.8, 9.6, 14.4 kbps, non-transparent ● Unstructured Supplementary Services Data (USSD) support
DATA EDGE	<ul style="list-style-type: none"> ● EDGE E2 power class for 8 PSK ● DTM (simple class A), multi-slot class 12 ● Downlink coding schemes – CS 1-4, MCS 1-9 ● Uplink coding schemes – CS 1-4, MCS 1-9 ● BEP reporting and test mode B ● 8-bit, 11-bit RACH ● PBCCH support ● phase/2 phase access procedures
DATA UMTS/HSDPA	<ul style="list-style-type: none"> ● Supports HS-DSCH (HS-SCCH, HS-PDSCH and HS-DPCCH) ● Supports a maximum of four simultaneous HS-SCCH channels ● Supports a maximum of 10 HS-PDSCH channels ● Supports both QPSK and 16 QAM modulation. ● Supports CQI, and ACK/NACK on HS-DPCCH channel ● Supports all incremental redundancy versions for HARQ ● Can switch between HS-PDSCH and DPCH channel resources as directed by the network. ● Can be configured to support any of the two power classes 3 or 4 ● Supports network activation of compressed mode by SF/2 or HLS on the DPCH for conducting inter-frequency or inter-RAT measurements when the HS-DSCH is active. ● STTD on both associated DPCH and HS-DSCH is supported simultaneously. ● CLTD mode 1 is supported on the DPCH when the HS-PDSCH is active. ● STTD on HS-SCCH is supported when either STTD or CLTD Mode 1 are configured on the associated DPCH. ● Supports TFC selection limitation on the UL factoring in the transmissions on the HS-DPCCH as required in TS 25.133.
SMS	<ul style="list-style-type: none"> ● MT, MO, CB, Text and PDU mode ● SMS storage: SIM card ● Support transmission of SMS alternatively over CSD or GPRS. User can choose preferred mode.
SIM interface	Support SIM card: 1.8V ,3V
External antenna	Connected via 50 Ohm antenna connector or antenna pad
Audio features	<p>Speech codec modes:</p> <ul style="list-style-type: none"> ● Half Rate (ETS 06.20) ● Full Rate (ETS 06.10) ● Enhanced Full Rate (ETS 06.50 / 06.60 / 06.80) ● AMR ● A5/1, A5/2, and A5/3 ciphering
Serial interface	<ul style="list-style-type: none"> ● Serial Port Seven lines on Serial Port Interface ● Serial Port can be used to control module by sending AT command.

Phonebook management	Support phonebook types: SM, FD, LD, RC, ON, MC.
SIM Application Toolkit	Support SAT class 3, GSM 11.14 Release 98 Support USAT
Real time clock	Implemented
Timer function	Programmable via AT command
Physical characteristics	Size: 35±0.15 x 35±0.15 x 4.4±0.2 mm Weight: 11g
Firmware upgrade	Firmware upgrade over USB interface

Table 4: Coding schemes and maximum net data rates over air interface

Coding scheme	1 Timeslot	2 Timeslot	4 Timeslot
CS-1:	9.05kbps	18.1kbps	36.2kbps
CS-2:	13.4kbps	26.8kbps	53.6kbps
CS-3:	15.6kbps	31.2kbps	62.4kbps
CS-4:	21.4kbps	42.8kbps	85.6kbps
MCS-1	8.80kbps	17.60kbps	35.20kbps
MCS-2	11.2kbps	22.4kbps	44.8kbps
MCS-3-	14.8kbps	29.6kbps	59.2kbps
MCS-4	17.6kbps	35.2kbps	70.4kbps
MCS-5	22.4kbps	44.8kbps	89.6kbps
MCS-6	29.6kbps	59.2kbps	118.4kbps
MCS-7	44.8kbps	89.6kbps	179.2kbps
MCS-8	54.4kbps	108.8kbps	217.6kbps
MCS-9	59.2kbps	118.4kbps	236.8kbps

Table 5 : Connection diagrams

Pin No	Define	Measure without usage	Pin No	Define	Measure without usage
1	VBAT	VBAT	70	VBAT	VBAT
2	VBAT	VBAT	69	VBAT	VBAT
3	VBAT	VBAT	68	VBAT	VBAT
4	GND	GND	67	GND	GND
5	GND	GND	66	GND	GND
6	UART_TXD	NC	65	GPIO0	NC
7	UART_CTS	NC	64	UART_RXD	NC
8	UART_DCD	NC	63	UART_RTS	NC
9	USB_VBUS	NC	62	UART_DTR	NC
10	GPIO1	NC	61	UART_RI	NC
11	VRTC	1u/6.3V cap to ground	60	USB_D_P	NC
12	USIM_CLK	NC	59	USB_D_M	NC
13	USIM_RESET	NC	58	GND	GND
14	CAM_D0	NC	57	V_USIM	NC
15	CAM_D2	NC	56	USIM_DATA	NC

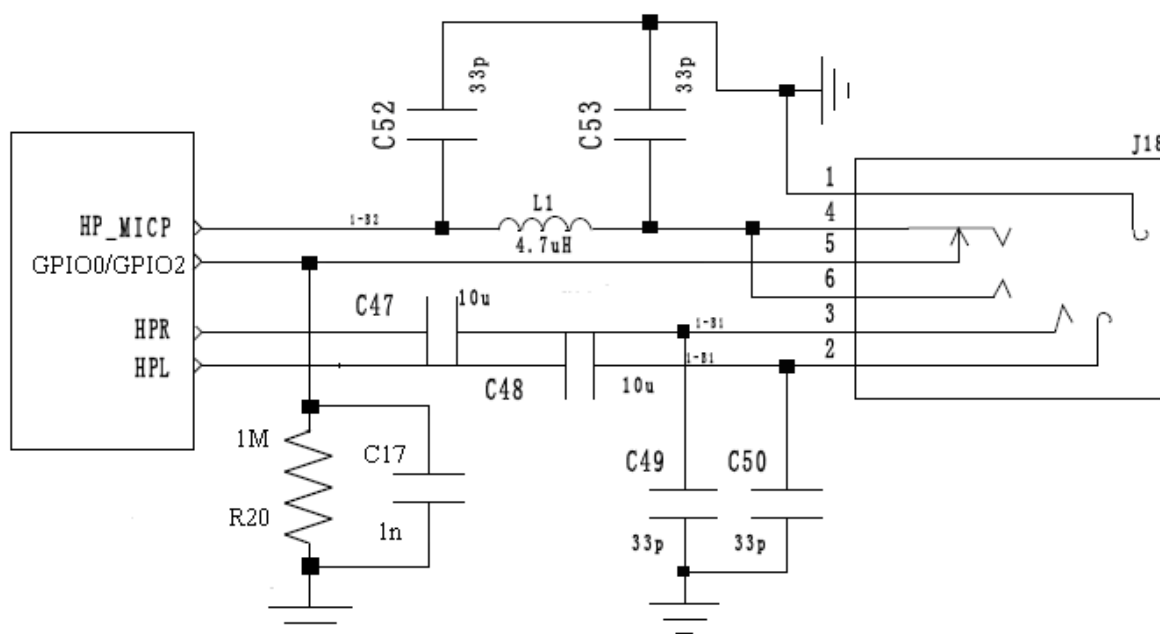
16	CAM_D4	NC	55	CAM_D1	NC
17	CAM_D6	NC	54	CAM_D3	NC
18	CAM_D8	NC	53	CAM_D5	NC
19	CAM_HSYNC	NC	52	CAM_D7	NC
20	GND	GND	51	CAM_D9	NC
21	CAM_CLK	NC	50	CAM_VSYNC	NC
22	CAM_STANDBY	NC	49	CAM_PCLK	NC
23	SPK_P	NC	48	CAM_RESET	NC
24	SPK_N	NC	47	IIC_SDA	NC
25	EAR_P	NC	46	IIC_SCL	NC
26	EAR_N	NC	45	POWER_ON	NC
27	HPR	NC	44	MIC_N	0.1u cap to ground
28	HPL	NC	43	MIC_P	0.1u cap to ground
29	RESET	NC	42	HP_MICP	NC
30	GPIO2	NC	41	LINE_IN_L	NC
31	GPIO3	NC	40	LINE_IN_R	NC
32	GPIO4	NC	39	SD_DATA3	NC
33	GPIO5	NC	38	SD_DATA2	NC
34	SD_CLK	NC	37	SD_DATA1	NC
35	SD_CMD	NC	36	SD_DATA0	NC

3 Application Notes

3.1 GPIO to indicate whether the headset presents or not

If you need to indicate the state of headset: connected or disconnected, you can connect GPIO0 or GPIO2 to the headset socket. Confirm that there is a pin which can indicate whether the headset is present or not on the socket.

The follows is the connection case.



GPIO0 is default triggered by level at low level. When you use GPIO0, you will have an interrupt mechanism to indicate. You need to configure the GPIO0 to be edge triggered by AT+CGPIO command. You will receive an interrupt message from the USB serial port:

“GPIO Interrupt Alarm!”

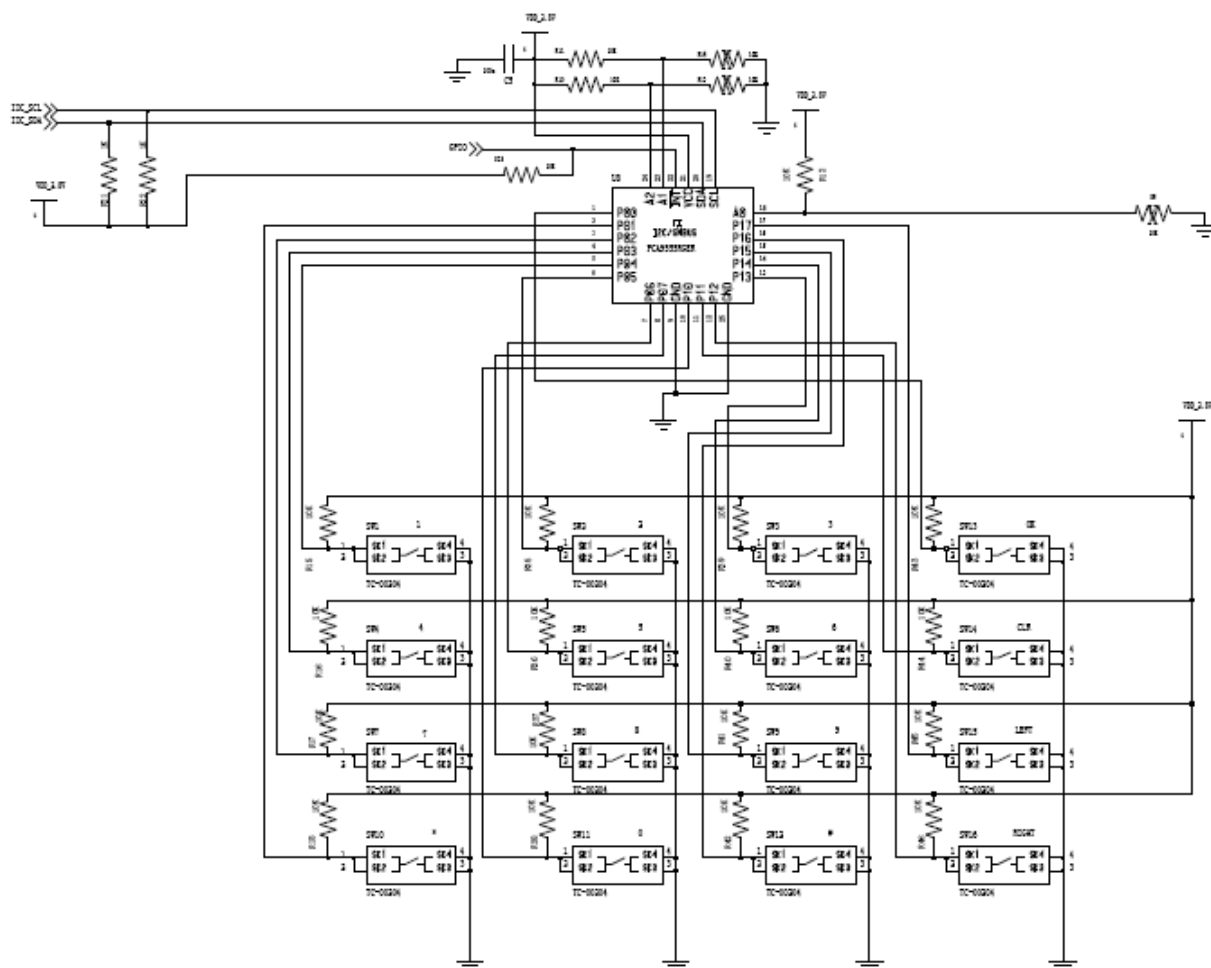
GPIO2 is default input pin. When you use GPIO2, you need read the GPIO value by yourself.

3.2 Use IIC to expand GPIO

If you want to expand GPIO for your purpose, we have IIC interface to do more. You can use AT+CRIIC and AT+CWIIC command to read and write the IIC expand GPIO. The IIC chip is PCA9555RGER.

For example, we implement an IIC keypad function on SIM5210. This function is based on the interrupt, when there is a key press, the chip will launch an interrupt to notify the base band. Base band will read the key id from IIC interface.

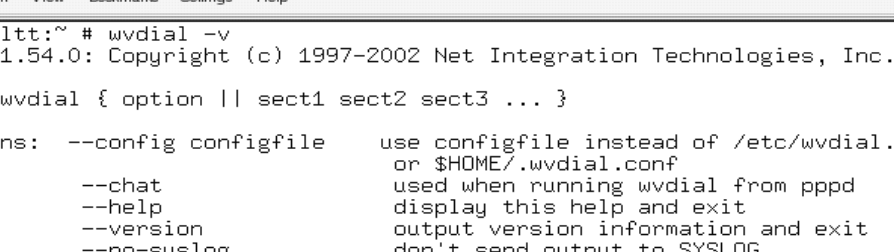
NOTE: If you want to use this function, interrupt pin must be connected to GPIO0. GPIO0 is default triggered by level at low level.



3.3 Use SIM5210 to access internet on linux

If you want to access internet on linux with this module, please follow the following steps:

1. make sure your system has the tool wvdial. Just use the command “wvdial -v” to check



```
Shell - Konsole
Session Edit View Bookmarks Settings Help

linux-1l1tt:~ # wvdial -v
WvDial 1.54.0: Copyright (c) 1997-2002 Net Integration Technologies, Inc.

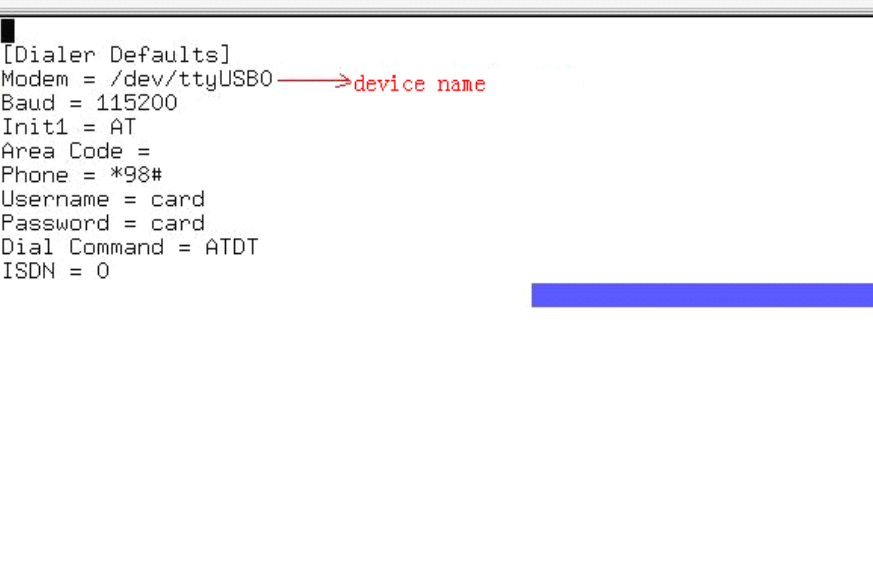
Usage: wvdial { option || sect1 sect2 sect3 ... }

options:  --config configfile    use configfile instead of /etc/wvdial.conf
                                         or $HOME/.wvdial.conf
          --chat                  used when running wvdial from pppd
          --help                  display this help and exit
          --version               output version information and exit
          --no-syslog             don't send output to SYSLOG

Optional "sect" arguments refer to sections in configuration file (usually)
/etc/wvdial.conf, $HOME/.wvdialrc or the file specified by --config.
Specified sections are all read, with later ones overriding previous ones.
Any options not in the listed sections are taken from [Dialer Defaults].

Report bugs to wvdial@nit.ca
linux-1l1tt:~ #
```

2. modify the config file located in `/etc/wvdial.conf`, if it doesn't existed, just create one. The context in this file is like this:

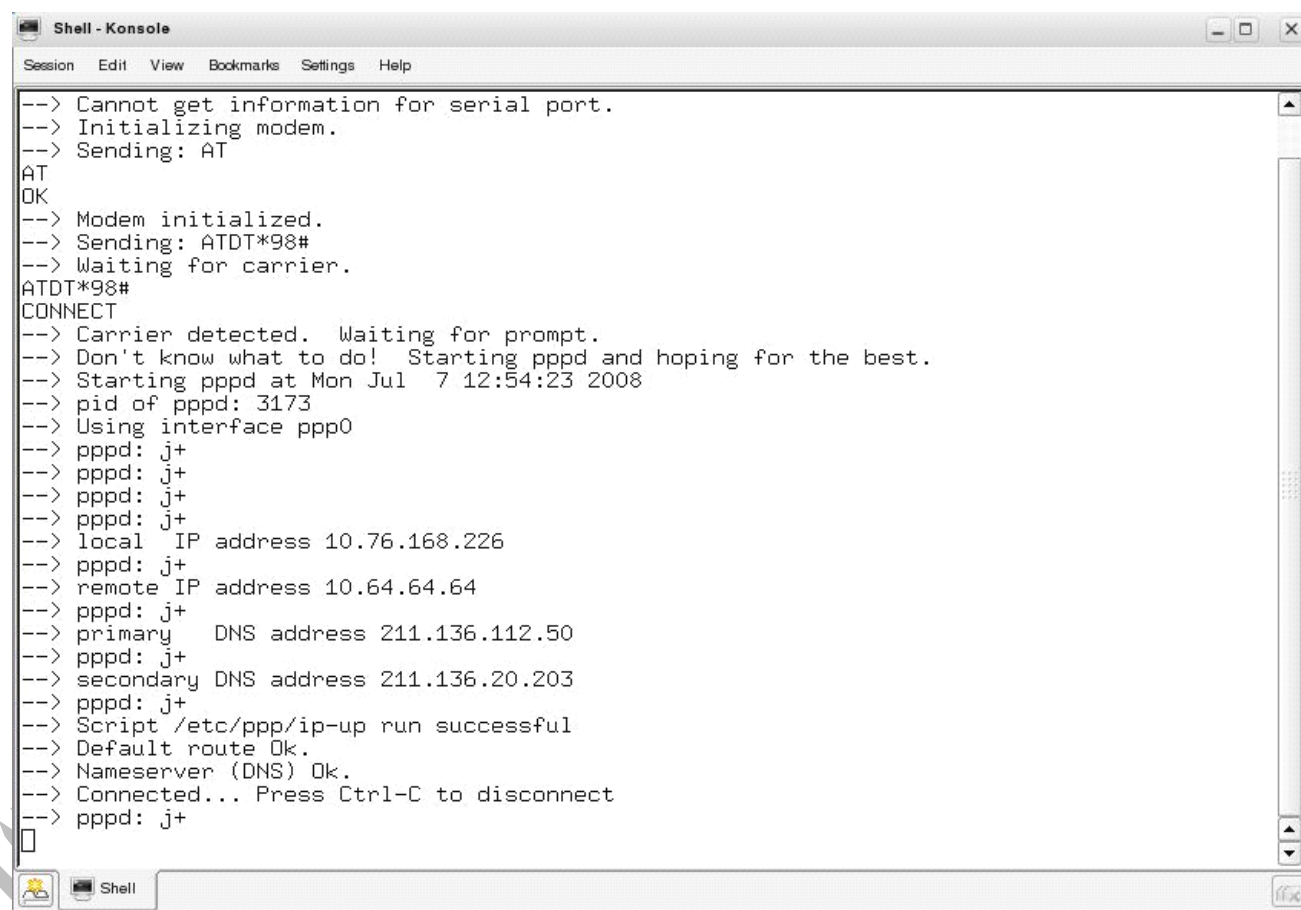


The screenshot shows a Windows desktop environment. A window titled "Shell - Konsole" is open, displaying a list of AT command defaults for a modem. The text in the window is as follows:

```
1 [Dialer Defaults]
2 Modem = /dev/ttyUSB0
3 Baud = 115200
4 Init1 = AT
5 Area Code =
6 Phone = *98#
7 Username = card
8 Password = card
9 Dial Command = ATDT
10 ISDN = 0
```

A red arrow points from the text "device name" to the value "/dev/ttyUSB0" in line 2. Below the list of commands, there are several tilde (~) characters. At the bottom right of the window, the text "1,0-1" and "All" are visible. The Windows taskbar at the bottom shows a "Shell" icon and the text "Shell".

3 use the tool “wvdial” to dial up, just type the command: wvdial



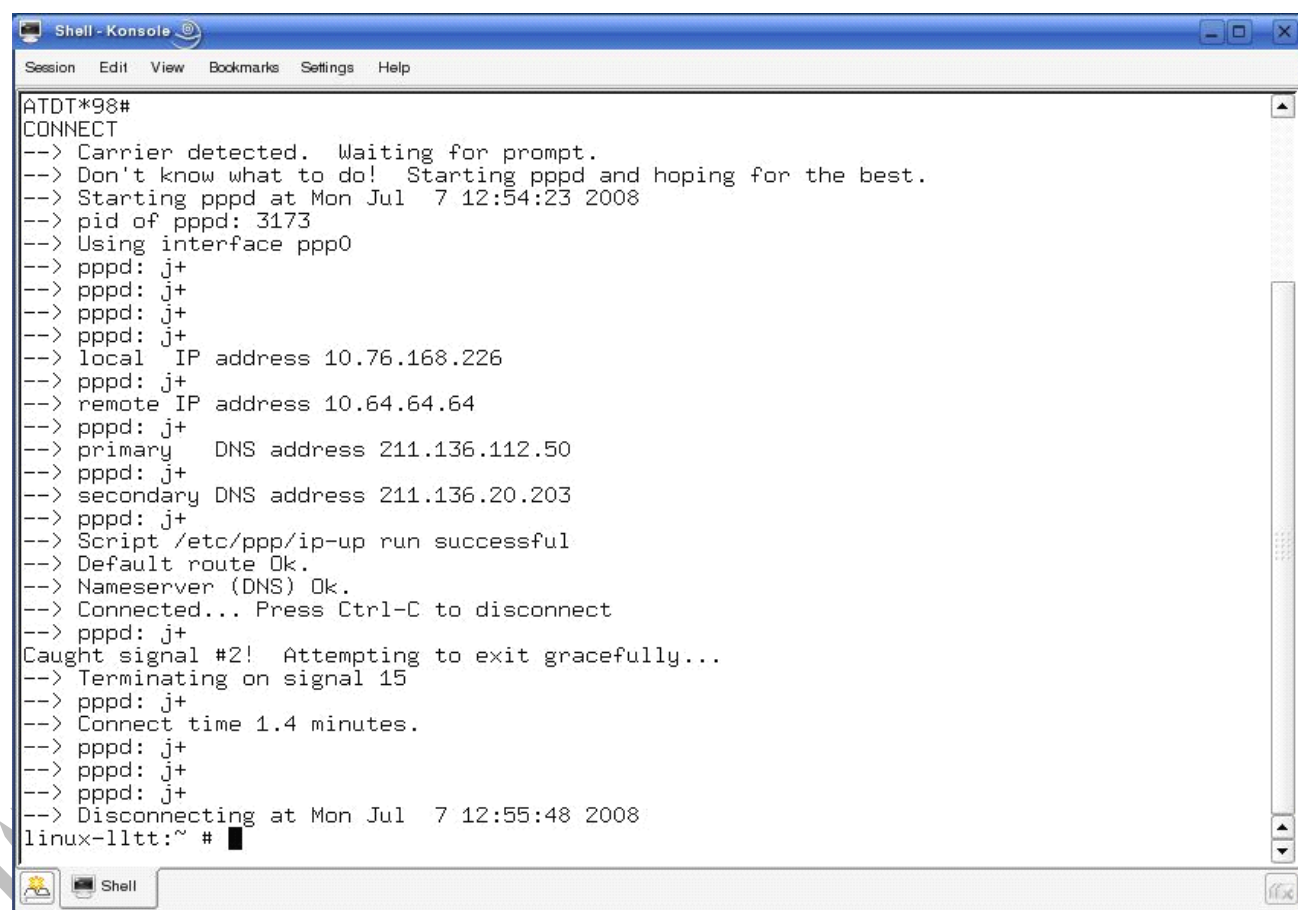
```
Shell - Konsole
Session Edit View Bookmarks Settings Help

--> Cannot get information for serial port.
--> Initializing modem.
--> Sending: AT
AT
OK
--> Modem initialized.
--> Sending: ATDT*98#
--> Waiting for carrier.
ATDT*98#
CONNECT
--> Carrier detected. Waiting for prompt.
--> Don't know what to do! Starting pppd and hoping for the best.
--> Starting pppd at Mon Jul 7 12:54:23 2008
--> pid of pppd: 3173
--> Using interface ppp0
--> pppd: j+
--> pppd: j+
--> pppd: j+
--> pppd: j+
--> local IP address 10.76.168.226
--> pppd: j+
--> remote IP address 10.64.64.64
--> pppd: j+
--> primary DNS address 211.136.112.50
--> pppd: j+
--> secondary DNS address 211.136.20.203
--> pppd: j+
--> Script /etc/ppp/ip-up run successful
--> Default route Ok.
--> Nameserver (DNS) Ok.
--> Connected... Press Ctrl-C to disconnect
--> pppd: j+
```

4 at this point you can right to access internet.



If you want to disconnect from internet just use "ctrl + c" to break up the wvdial.



```
Shell - Konsole
Session Edit View Bookmarks Settings Help

ATDT*98#
CONNECT
--> Carrier detected. Waiting for prompt.
--> Don't know what to do! Starting pppd and hoping for the best.
--> Starting pppd at Mon Jul 7 12:54:23 2008
--> pid of pppd: 3173
--> Using interface ppp0
--> pppd: j+
--> pppd: j+
--> pppd: j+
--> pppd: j+
--> local IP address 10.76.168.226
--> pppd: j+
--> remote IP address 10.64.64.64
--> pppd: j+
--> primary DNS address 211.136.112.50
--> pppd: j+
--> secondary DNS address 211.136.20.203
--> pppd: j+
--> Script /etc/ppp/ip-up run successful
--> Default route Ok.
--> Nameserver (DNS) Ok.
--> Connected... Press Ctrl-C to disconnect
--> pppd: j+
Caught signal #2! Attempting to exit gracefully...
--> Terminating on signal 15
--> pppd: j+
--> Connect time 1.4 minutes.
--> pppd: j+
--> pppd: j+
--> pppd: j+
--> Disconnecting at Mon Jul 7 12:55:48 2008
linux-lltt:~ #
```

Note: you must use AT command: +CGDCONT first.