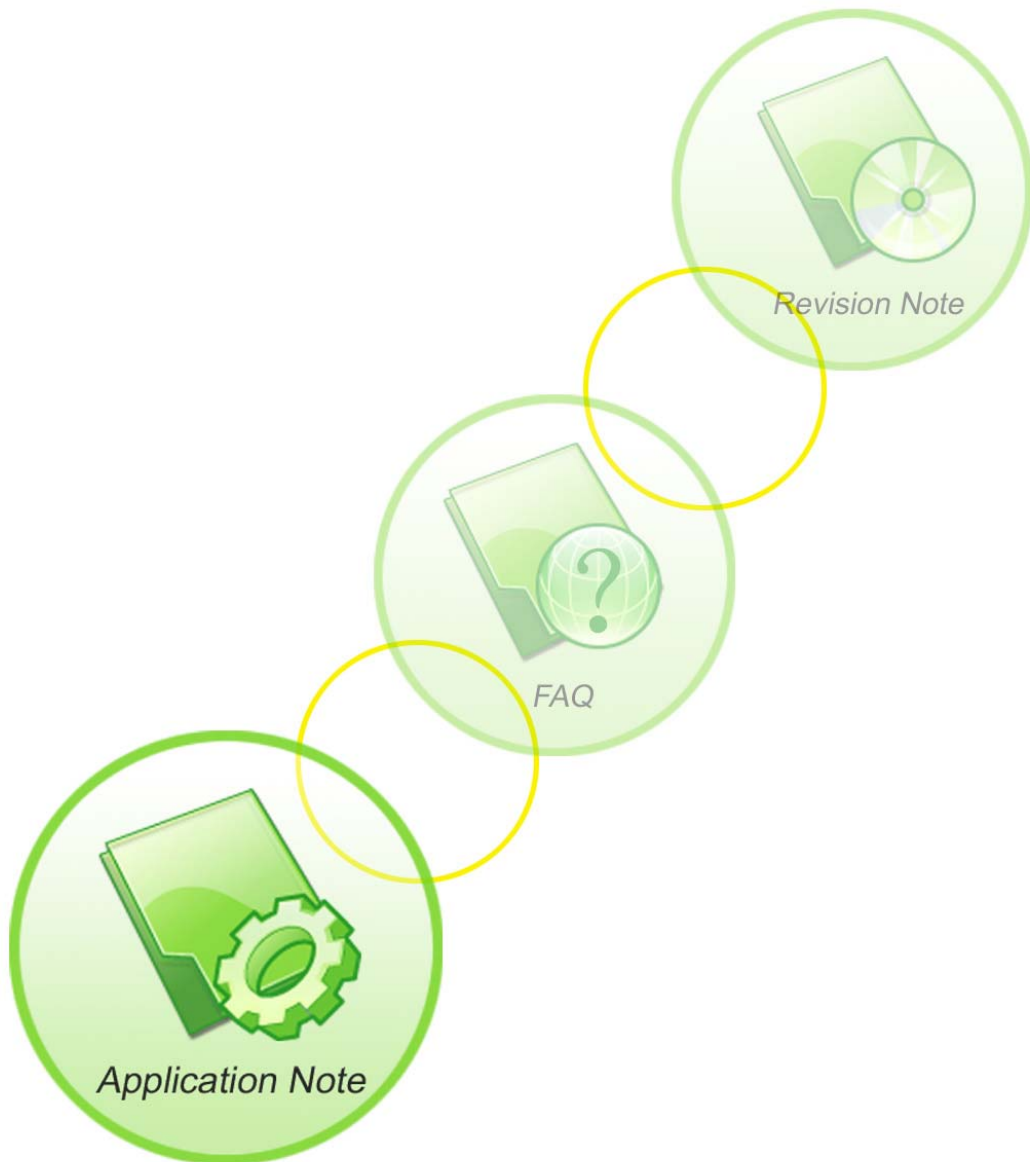




SIMCOM WCDMA

Wireless Module

SIM5360 Keypad Application Note



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Version history

Date	Version	Description of change	Author
2013-12-28	0.01	Origin	silin.zhu

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1 Introduction

1.1 Overview

SIMcom modules provide a keypad interface that supports five sense lines, or columns, and five keypad rows. The columns are used for sensing (KEYSENSE_Nx); The rows are used for driving (KEYPAD_x). The interface generates an interrupt when any key is pressed. This document describes the decoding of keyboard matrix application of SIMcom modules that is used to design for POS, handset, include the dual-mode mobile phone, PDA, and the others.

SIM5360 Keypad Feature

- Supports five sense lines and five keypad rows, 25 keys.
- Can be configured to GPIO.
- ESD protect inside.
- 1.8V operate.

1.2 Scope of the document

This document is intended for the following versions of the SIMCom modules

- SIM5360

1.3 References

The present document is based on the following documents:

- [1] SIMCOM_SIM5360_ATC_EN_V0.05.doc
- [2] SIMCOM_SIM5360_HD_EN.pdf

1.4 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
- TA Terminal Adaptor; e.g. a data card (equal to DCE)
- TE Terminal Equipment; e.g. a computer (equal to DTE)
- UMTS Universal Mobile Telecommunications System
- URC Unsolicited Result Code
- USIM Universal Subscriber Identity Module
- WCDMA Wideband Code Division Multiple Access

2 Recommended application circuit

2.1 Keypad interface circuit

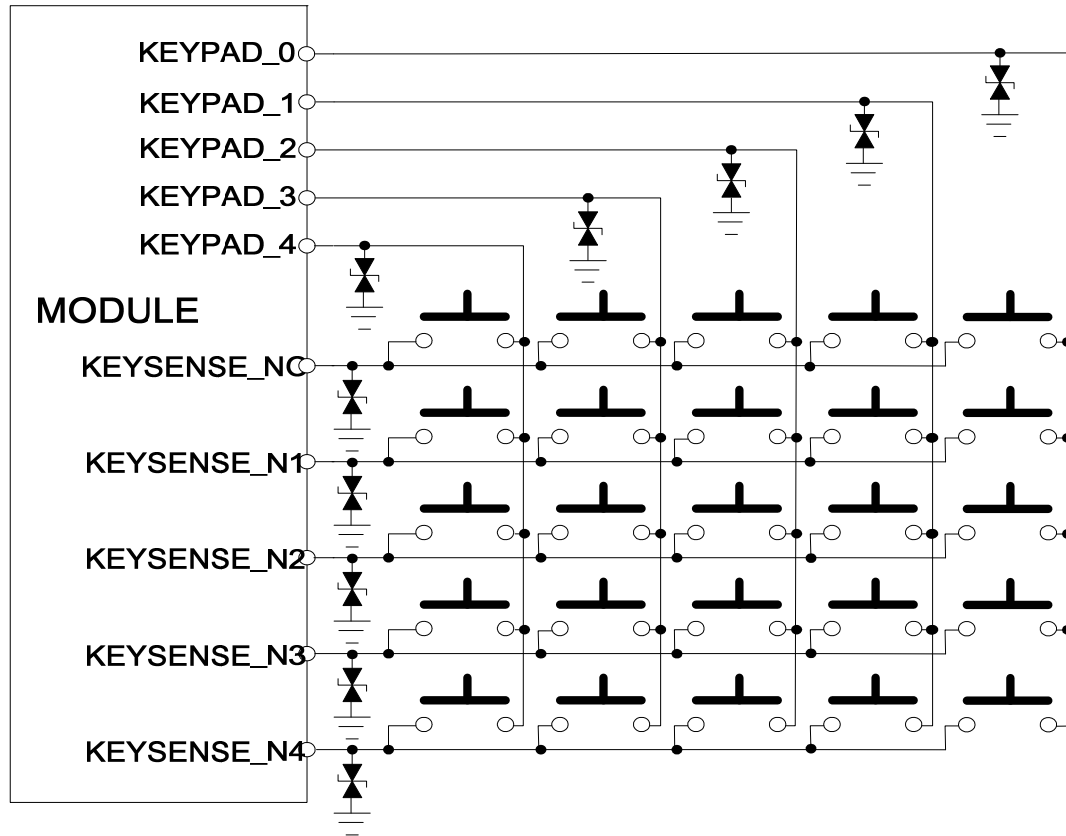


Figure 1: keypad interface matrix(With ESD protection)

When a keypad button is pressed, its corresponding column is pulled low (since all rows are low). Since it is an active low sense line, the module begins scanning the keypad. During a scan, each row is sequentially driven low, one at a time. As each row is driven low, the columns are sensed. The precise keypad button being pressed is revealed when that button's column reads low while that button's row is driven low.

Note: keypad is 1.8V operation.

The keypad should include ESD protection. Although some ESD components have been added in our model, to improve ESD, one should put some ESD components on customer host board. The ESD components should be placed beside the connectors which the human body might touch. We recommend using an Electro-Static discharge device DF2S6.8S.

2.2 Electrical Specifications

Key Digital I/O specifications are presented in Table 1.

Table 1: Pin Description

Keypad interface			
PIN NAME	I/O	DESCRIPTION	DC CHARACTERISTICS
KEYPAD_0	O	Bit 0 drive to the pad matrix	VOLmin=GND VOLmax=0.45V VOHmin=1.35V VOHmax=1.8V
KEYPAD_1	O	Bit 1 drive to the pad matrix	
KEYPAD_2	O	Bit 2 drive to the pad matrix	
KEYPAD_3	O	Bit 3 drive to the pad matrix	
KEYPAD_4	O	Bit 4 drive to the pad matrix	
KEYSENSE_N0	I	Bit 0 for sensing key press on pad matrix	VILmin=GND VILmax=0.63V VIHmin=1.17V VIHmax=2.1V
KEYSENSE_N1	I	Bit 1 for sensing key press on pad matrix	
KEYSENSE_N2	I	Bit 2 for sensing key press on pad matrix	
KEYSENSE_N3	I	Bit 3 for sensing key press on pad matrix	
KEYSENSE_N4	I	Bit 4 for sensing key press on pad matrix	

2.3 Keyboard matrix codes

The following table shows codes of keyboard matrix. Key codes is hexadecimal format. The function can be redefined by customer. Functions are reference in table 2.

Table 2: Key codes

KEY VALUE REFERENCE				
<key>	<key_row>	<key_column>	function(default)	description
0x01	2	4	"MSG"	Message select
0x02	1	3	"#"	# key
0x03	1	1	"*"	* key
0x04	1	2	"0"	Number 0
0x05	4	1	"1"	Number 1
0x06	4	2	"2"	Number 2
0x07	4	3	"3"	Number 3
0x08	3	1	"4"	Number 4
0x09	3	2	"5"	Number 5
0x0A	3	3	"6"	Number 6
0x0B	2	1	"7"	Number 7
0x0C	2	2	"8"	Number 8
0x0D	2	3	"9"	Number 9
0x0E	1	0	"BACK"	Back key

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0x0F	4	0	"REJECT"	Cancel a operation
0x10	3	4	"UP"	Up key
0x11	0	4	"DOWN"	Down key
0x12	1	4	"CALL"	Setup a call
0x13	3	0	"MENU"	Show function list
0x14	4	4	"SELECT"	Affirm key
0x15	0	0	"HANDFREE"	Talk without hang up
0x16	0	2	"NAMES"	address list
0x17	0	3	"V+"	Volume increase
0x18	0	1	"V-"	Volume decrease
0x19	2	0	"SET"	Setting key
0xFF	row and column is same as the key pressed		"RELEASE"	

3 Keypad setting

AT+CKGSWT command is used to switch pins' function between keypad interface and general GPIO. If no keypad subsystem, the total 10 pins can be used as general GPIO after switching mode successfully. Keypad mode is default.

3.1 Keypad mode

Keypad function is selected if you execute AT+CKGSWT=1. For example:

```
AT+CKGSWT=?
+CKGSWT: (0-1)
```

OK

```
at+ckgswt?
```

```
+CKGSWT: 1
```

OK

The system can capture an interrupt when any key is pressed, then a correlated function is operated. Key codes can be show on hyperterminal. For example:

(Press the menu key, and then release the key):

```
+KEY: 0x16, [0, 2], "NAMES"
+KEY: 0xFF, [3, 0], "RELEASE"
```

3.2 GPIO mode

Keypad pins can be release to GPIOs. In general GPIO mode, GPIO AT command can be used to config the GPIOs' direction and value. These GPIOs cannot support interrupt if set as input pin.

AT+CKGSWT=0

OK

Table 3: GPIOs list

KEYPAD	INTERFACE	<----->	GENERAL GPIO NUMBER
	KEYPAD_4		GPIO6
	KEYPAD_3		GPIO7
	KEYPAD_2		GPIO8
	KEYPAD_1		GPIO9
	KEYPAD_0		GPIO10
	KEYSENSE4		GPIO11
	KEYSENSE3		GPIO12
	KEYSENSE2		GPIO13
	KEYSENSE1		GPIO14
	KEYSENSE0		GPIO15

AT+CGDRT is used to set the specified GPIO to in or out state. For example, you can do this operation if you want to set GPIO6 as a output pin.

AT+CGDRT=6,1

OK

AT+CGSETV is used to set the value of the specified GPIO to high or low. For example;

AT+CGSETV=6,1

OK

AT+CGGETV is used to get the value(high or low) of the specified GPIO. Before this operation, you must set GPIO as input. For example;

AT+CGDRT=6,0

OK

AT+CGGETV=6,1

+CGGETV: 0

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