

JAL: SI4432 Register Viewer

last updated: 26-okt-2014, Stef Mientki

Introduction

Creating the correct register settings for the SI4432 is often a terrible job. The formula in the manual are sometimes not correct, i.e. they differ from the formula used in the Excel sheet. Implementing the (correct) formula in JAL isn't an easy job either, using floats isn't still bug free, using integers (dword) often results in silent overflows. For these reasons I needed a tool that could do the following:

- Compare the current SI4432 register settings with the Excel sheet
- Compare the current SI4432 register settings with the default setting
- Generate a JAL procedure that sets the SI4432 registers correctly
- Handling different Excel sheets for different projects

Unfortunately this program only runs fully under MS-Windows (XP or greater). Instead of Excel also Kingsoft Office Suite can be used.

JAL: SI4432 Register Viewer (version 0.1)

Read from SI4432

- (F0) SI4432_Spectrum_Analyzer
- (F1) SI4432_Stream_Viewer
- (F2) SI4432 after Init from Excel
- (F3) SI4432 after Reset
- (F4) SI4432_Project_4
- (F5) SI4432_Project_5
- (F6) SI4432_Project_6
- (F7) SI4432_Project_7

0x90 0x91 0x92 0x93 0x94

Comm PDF-File Help-File Clear Save

Modulation

- OOK-Rx
- OOK-Tx
- FSK-Rx
- FSK-Tx
- GFSK-Rx
- GFSK-Tx

Address	Reset	PIC	Excel	PIC	Excel	Diff
96	0x5f	0xE7	0xE7	1110	0111	
97	0x60	0xA0	0xA0	1010	0000	
98	0x61	0x00	0x00	0000	0000	
99	0x62	0xE4	0xE4	1110	0100	
100	0x63	0x00	0x00	0000	0000	
101	0x64	0x00	0x00	0000	0000	
102	0x65	0xFE	0xFE	1111	1110	
103	0x66	0x62	0x62	0110	0010	
104	0x67	0xFF	0xFF	1111	1111	
105	0x68	0x13	0x13	0001	0011	
106	0x69	0x71	0x71	0111	0001	0110 0000 *** AGC Override 1 (if bit
107	0x6a	0x9D	0x9D	1001	1101	
108	0x6b	0x00	0x00	0000	0000	
109	0x6c	0x01	0x01	0000	0001	
110	0x6d	0x18	0x18	0001	1000	TX Power
111	0x6e	0x0A	0x0A	0x14	0000 1010	0001 0100 *** TX Data Rate 1
112	0x6f	0x3D	0x3D	0x7B	0011 1101	0111 1011 *** TX Data Rate 0
113	0x70	0x0C	0x0C	0x24	0000 1100	0010 0100 *** Modulation Mode Cont
114	0x71	0x01	0x01	0x21	0000 0001	0010 0001 *** Modulation Mode Cont
115	0x72	0x20	0x20		0010 0000	
116	0x73	0x00	0x00		0000 0000	
117	0x74	0x00	0x00		0000 0000	
118	0x75	0x53	0x53	0x53	0101 0011	0101 0011 Frequency Band Sele
119	0x76	0x62	0x62	0x62	0110 0010	0110 0010 Nominal Carrier Freq
120	0x77	0x00	0x00	0x00	0000 0000	0000 0000 Nominal Carrier Freq
121	0x78	0x19	0x19		0001 1001	
122	0x79	0x00	0x00		0000 0000	
123	0x7a	0x00	0x00		0000 0000	
124	0x7b	0x03	0x03		0000 0011	

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Register 69h. AGC Override 1

Bit	D7	D6	D5
Name		sgin	agcen
Type	R	R/W	R/W

Reset value = 00100000

Bit	Name	
7	Reserved	
6	sgin	sgin=AGC stop inon increases during sig; signal reductions are AMBLE_VALID sign
5	agcen	Automatic Gain Co agcen=Automatic G; can be read out from into bits [4:0]
4	lnagain	LNA Gain Select. lnagain=LNA Gain : 0 - min. gain = 5 dB
3:0	pga[3:0]	PGA Gain Override 0000: 0 dB 0001: 3 dB 0010: 6 dB ... 1000: 24 dB max.

General use

- Select the special Project F3, so the default reset values from the SI4432
- Select the Project, reads the registers from the SI4432, but above all specifies which Excel file will be used
- Select the Modulation mode, opens Excel File
- Edit the Excel File
- Select the Modulation mode again, will copy register settings to the table, generates the JAL code
- Load the JAL code into the PIC
- Test the register settings by selecting the Project

Reading the registers

By (re-)selecting a Project, the Comm port is connected (green light), the registers are read from the SI4432 and put into the table, after which the Comm-port is disconnected (red light), allowing for modifying the loaded JAL file in the PIC. Pressing the already selected radiobutton will reread all the registers.

There's a special Project "(F3) SI4432 after Reset" which will read the registers of the SI4432 after a (software) reset. which should be equal to the default values after a Power-UP. The values read in this mode are placed in the second column of the table, called "Reset".

Reading from the Excel file

Clicking on a radiobutton from Modulation of transmission reads the values calculated by the Excel sheet. If an Excel sheet with the name of the selected program ("Read from SI4432") exists, the Excel file with that name will be opened. So if "(F1) SI4432_Stream_Viewer" was selected and in the program directory exists a file "SI4432_Stream_Viewer.xlsx", this file will be opened, otherwise a general Excel file will be opened. In this way you can have a separate Excel file for each project.

Selected the modulation mode also generates the JAL code. All relevant registers are put into the JAL file. If the desired value is equal to the default reset value, it's commented out. The parameters chozen in the Excel file are put as comment in the beginning of the JAL code.

JAL: SI-4432 Register Viewer (version 0.1)

Project (Read SI4432)

- (F0) SI4432_Spectrum_Analyzer
- (F1) SI4432_Stream_Viewer**
- (F2) SI4432 after Init from Excel
- (F3) SI4432 after Reset
- (F4) SI4432_Project_4
- (F5) SI4432_Project_5
- (F6) SI4432_Project_6
- (F7) SI4432_Project_7

0x90 0x91 0x92 0x93 0x94

Comm PDF-File Help-File Clear Save

Modulation

- OOK-Rx**
- OOK-Tx
- FSK-Rx
- FSK-Tx
- GFSK-Rx
- GFSK-Tx

Address	Reset	PIC	Excel	PIC	Excel	Diff	
22	0x15	0x00	0x00		0000 0000		Wake-Up Timer Period
23	0x16	0x01	0x01		0000 0001		Wake-Up Timer Period
24	0x17	0x00	0x00		0000 0000		Wake-Up Timer Value
25	0x18	0x00	0x00		0000 0000		Wake-Up Timer Value
26	0x19	0x01	0x01		0000 0001		Low Duty Cycle Mode
27	0x1A	0x14	0x14		0001 0100		Low Battery Detector
28	0x1B	0x00	0x00		0000 0000		Battery Voltage Level
29	0x1C	0xBE	0xBE	0xBE	1011 1110	1011 1110	IF Filter Bandwidth
30	0x1D	0x44	0x44	0x40	0100 0100	0100 0000	*** AFC Loop Gearshift C
31	0x1E	0x0A	0x0A		0000 1010		AFC Timing Control
32	0x1F	0x00	0x00	0x00	0000 0000	0000 0000	Clock Recovery Gear
33	0x20	0x58	0x58	0x58	0101 1000	0101 1000	Clock Recovery Overs
34	0x21	0x40	0x40	0x40	0100 0000	0100 0000	Clock Recovery Offse
35	0x22	0x36	0x36	0x36	0011 0110	0011 0110	Clock Recovery Offse
36	0x23	0x9D	0x9D	0x9D	1001 1101	1001 1101	Clock Recovery Offse
37	0x24	0x10	0x10	0x10	0001 0000	0001 0000	Clock Recovery Timing
38	0x25	0x39	0x39	0x39	0011 1001	0011 1001	Clock Recovery Timing
39	0x26	0xC4	0xC2		1100 0010		RSSI Received Signal
40	0x27	0x1E	0x1E		0001 1110		RSSI Threshold for Cle
41	0x28	0x00	0x00		0000 0000		Antenna Diversity 1
42	0x29	0x00	0x00		0000 0000		Antenna Diversity 2
43	0x2A	0x00	0x00		0000 0000		AFC Limiter
44	0x2B	0x00	0x00		0000 0000		AFC Correction (MSB)
45	0x2C	0x29	0x29	0x29	0010 1001	0010 1001	OOK Counter Value 1
46	0x2D	0xF4	0xF4	0xF4	1111 0100	1111 0100	OOK Counter Value 2
47	0x2E	0x2B	0x2B	0x2B	0010 1011	0010 1011	Slicer Peak Holder
48	0x2F	0x08	0x08		0000 1000		Reserved
49	0x30	0x8D	0x8D		1000 1101		Data Access Control (
50	0x31	0x20	0x20		0010 0000		EZMAC status (Packer

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procedure SI4432_Init_from_Excel () is
-- Modulation Type : OOK
-- Manchester : OFF
-- Carrier Frequency : 433.92 [MHz]
-- Data Rate : 2.5 [kb/s]
-- Receiver Bandwidth : 600.0 [kHz]

SI4432_Reset ()

;SI4432_Write ( 0x06, 0x00 ) -- Interrupt Enable 2
;SI4432_Write ( 0x07, 0x07 ) -- Operating Mode and Functi
;SI4432_Write ( 0x0B, 0x1F ) -- GPIO Configuration 0
;SI4432_Write ( 0x0C, 0x1D ) -- GPIO Configuration 1
;SI4432_Write ( 0x0D, 0x14 ) -- GPIO Configuration 2
;SI4432_Write ( 0x1C, 0xBE ) -- IF Filter Bandwidth
SI4432_Write ( 0x1D, 0x40 ) -- AFC Loop Gearshift Overrid
;SI4432_Write ( 0x1F, 0x00 ) -- Clock Recovery Gearshift C
;SI4432_Write ( 0x20, 0x58 ) -- Clock Recovery Oversampl
;SI4432_Write ( 0x21, 0x40 ) -- Clock Recovery Offset 2
;SI4432_Write ( 0x22, 0x36 ) -- Clock Recovery Offset 1
;SI4432_Write ( 0x23, 0x9D ) -- Clock Recovery Offset 0
;SI4432_Write ( 0x24, 0x10 ) -- Clock Recovery Timing Loop
;SI4432_Write ( 0x25, 0x39 ) -- Clock Recovery Timing Loop
;SI4432_Write ( 0x2C, 0x29 ) -- OOK Counter Value 1
;SI4432_Write ( 0x2D, 0xF4 ) -- OOK Counter Value 2
;SI4432_Write ( 0x2E, 0x2B ) -- Slicer Peak Holder
SI4432_Write ( 0x69, 0x60 ) -- AGC Override 1 (if bit5=1: r
SI4432_Write ( 0x6E, 0x14 ) -- TX Data Rate 1
SI4432_Write ( 0x6F, 0x7B ) -- TX Data Rate 0
SI4432_Write ( 0x70, 0x24 ) -- Modulation Mode Control 1
SI4432_Write ( 0x71, 0x21 ) -- Modulation Mode Control 2
;SI4432_Write ( 0x75, 0x53 ) -- Frequency Band Select
;SI4432_Write ( 0x76, 0x62 ) -- Nominal Carrier Frequency
;SI4432_Write ( 0x77, 0x00 ) -- Nominal Carrier Frequency
end procedure

```

Save button

Pressing the save button, saves the tabel in a csv-file and the JAL code in a JAL file.

Comm button



Comm port is connected to this program



Comm port is disconnected and thus can be sued by the PIC-programmer.

PDF-File / Help-File

PDF-File button shows PDF-File about the registers of the SI4432.

Help-file button shows this document on the right side of the program.

General purpose buttons

There are 5 general purpose buttons, which sends commands with codes 0x90 .. 0x94 to the PIC.

0x90 0x91 0x92 0x93 0x94

History

october 2014: **Version 0.1**, initial release

ToDo / Future ideas

- load the table from a csv file
-

Background Information

Register 0x69

because bit 5 (0x60) is set, bits [4:0] reads back the LNA gain (which will differ from reading to reading)

106	0x69	0x71	0x60	0111 0001	0110 0000	***	AGC Override 1 (if bit5=1: reads LNA Gain)
106	0x69	0x75	0x60	0111 0101	0110 0000	***	AGC Override 1 (if bit5=1: reads LNA Gain)

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Si4430/31/32-B1

6.7. Preamble Length

The preamble detection threshold determines the number of valid preamble bits the radio must receive to qualify a valid preamble. The preamble threshold should be adjusted depending on the nature of the application. The required preamble length threshold will depend on when receive mode is entered in relation to the start of the transmitted packet and the length of the transmit preamble. With a shorter than recommended preamble detection threshold the probability of false detection is directly related to how long the receiver operates on noise before the transmit preamble is received. False detection on noise may cause the actual packet to be missed. The preamble detection threshold is programmed in register 35h. For most applications with a preamble length longer than 32 bits the default value of 20 is recommended for the preamble detection threshold. A shorter Preamble Detection Threshold may be chosen if occasional false detections may be tolerated. When antenna diversity is enabled a 20-bit preamble detection threshold is recommended. When the receiver is synchronously enabled just before the start of the packet, a shorter preamble detection threshold may be used. Table 14 demonstrates the recommended preamble detection threshold and preamble length for various modes.

It is possible to use Si4432/31/30 in a raw mode without the requirement for a 010101... preamble. Contact customer support for further details.

```

504 -- *****
505 -- writes all registers of the SI4432 to the serial port
506 -- (in chunks of 16 bytes)
507 -- *****
508 procedure SI4432_Dump_Registers is
509   for 128 using i loop
510     if ( i % 16 ) == 0 then
511       delay_100ms ( 1 )
512     end if
513     serial_hw_write ( SI4432_Read ( i ) )
514   end loop
515   delay_100ms ( 1 )
516
517 -- send my ID again
518 serial_hw_write ( 0xAA )
519 serial_hw_write ( 0xBB )
520 serial_hw_write ( 0xCC )
521 delay_100ms ( 1 )
522 end procedure
523 -- *****

```

```

AA BB CC
08 06 21 20 12 00 00 07 00 7F 06 1F 1D 14 00 00
00 00 20 00 03 00 01 00 00 01 14 00 31 00 0A 00
C8 00 A3 D7 10 A6 3F 1E 00 00 00 00 29 F4 29 08
00 20 00 80 00 00 2D D4 00 00 00 00 00 00 00 00
00 00 00 FF 00 00 00 00 00 00 00 FF 08 08 08 10
00 00 DF 52 20 64 00 01 87 00 09 94 0E E7 83 E7
A0 00 E4 00 00 FE 62 FF 13 75 9D 00 01 18 0A 3D
00 01 20 00 00 53 62 00 19 00 00 03 37 04 37 AA
AA BB CC

```