General SPI Design

For BK2535 FLASH

Approvals

Name	Date	Signature

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Revision History

Rev.	Date (YY/MM/DD)	Author(s)	Remark
0.1		caokang	Used for FLASH of grace

Content

1. Introduction

The SPI interface is used to download program into FLASH space. It act as SPI slave, so you need develop SPI master on another MCU chip to communicate with BK2535 SPI interface.

2. PIN

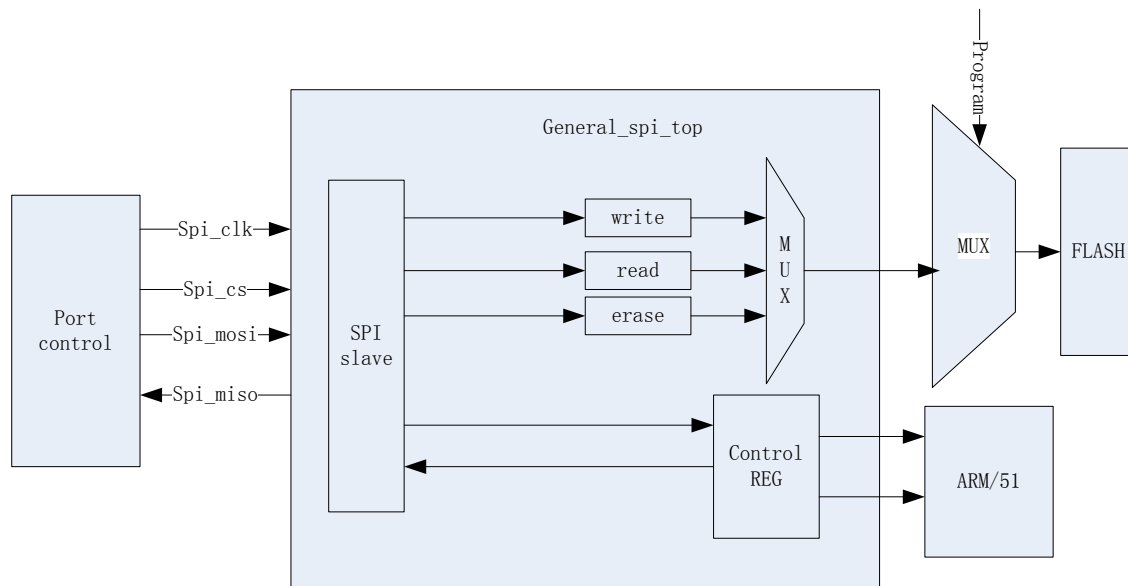There are four pin shared with GPIO. They are SPI_clk, SPI_cs, SPI_mosi, SPI_miso.

P0.4= SPI_mosi

P0.5= SPI_miso

P0.6= SPI_clk

P0.7= SPI_cs

3. Diagram

4. Interface timing

Read timing

Command (8bits)	Address(8 or 16 bits)	Read back data (8 bits)

Write timing

Command (8bits)	Address(8 or 16 bits)	write data (8 bits)

Pure command

Command (8bits)		

5. Command description

command	operation	description	note
8'h00			Only command
8'h01			Only command
8'h11			
8'h12			
8'h14	flash crc check		Only command
8'h15	Memory_bist		Only command
8'h21	Write FLASH		Command+16bits address+data[7:0]
8'h22	Read FLASH		Command+16bits address+wait to read spi_miso
8'h23	erase FLASH page		Command+16 bits address page(address /512)
8'h25	erase whole FLASH		Only command
8'h31	Write reg		Only command
8'h32	Read reg		Only command

6. Register

8'h00	Mbist_pass	7	0	R	Mbist pass
/status register	Mbist_fail	6	0	R	Mbist fail
(BK2535 ROM/FLASH)	FLASH_crc_result	5:4	0	R	10:FLASH CRC check done and pass 01: FLASH CRC check done and fail
		3	0	R	NA
		2	0	R	NA
		1	0	R	NA
		0	0	R	NA
8'h01		7:6	00	RW	NA
/control register	Operate object select	5:4	00	RW	00:MAIN SPACE 01:NVR SPACE

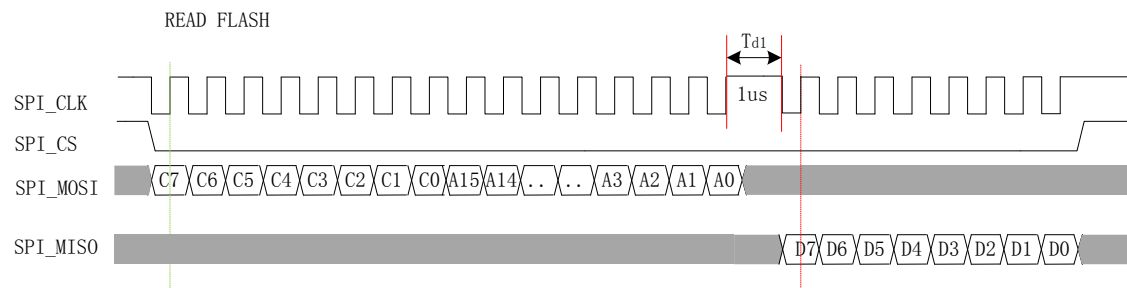|					
	Soft_Prog_mode (BK2535)	1	0		Must clear 0
	Reset_MCU	0	0	RW	1, reset mcu now; 0: don't reset mcu
8'h02	Wp_reg1	7：0	0	RW	It must be A5,when write/erase information page
8'h03	Wp_reg2	7：0	0	RW	It must be C3, when write/erase information page
8'h04		7：1	0	RW	NA
	Write_miso_oe_reg	0	0	RW	It must be 1 if you want to receive data from spi_miso pin. Otherwise,keep 0 is OK.

7. Note

- This module can work only at program=1.
- 16M stable clock should be work normally in program mode. (when program=1)
- This module can be reset by the control register, also it can be reset by POR and reset pin.
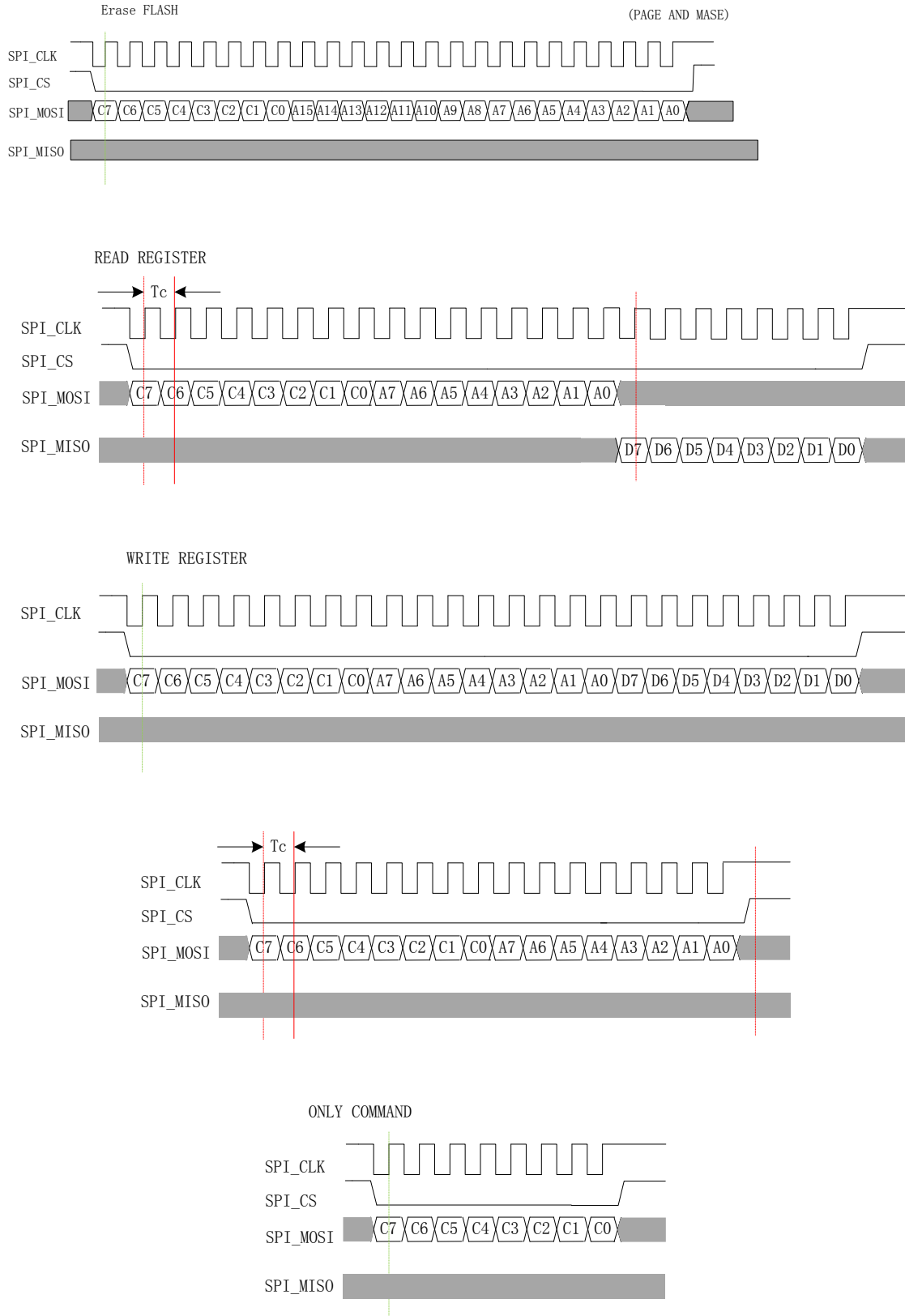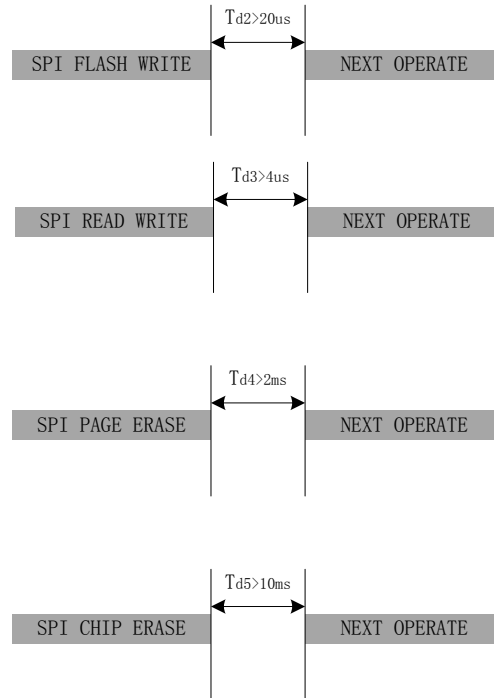- SPI clock <=4Mhz

8. SPI timing
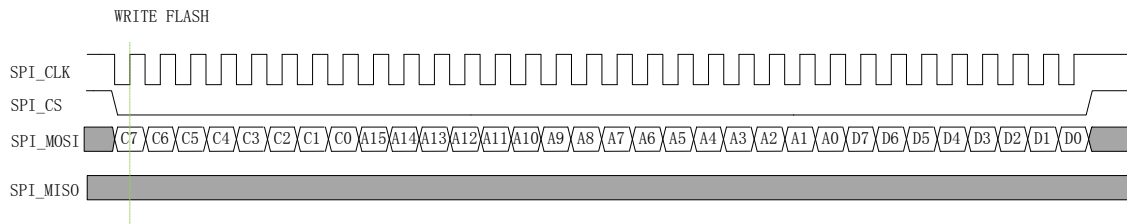
Write_flash,只需等待 25us(大于 20us),直接写入 data 即可，不需要再写地址信息。

同样 read_flash,只要时刻检测 MISO 信号，读出完整数据即可。

Erase FLASH   (PAGE AND MASE)

SPI_CLK
SPI_CS
SPI_MOSI | C7 | C6 | C5 | C4 | C3 | C2 | C1 | C0 | A15 | A14 | A13 | A12 | A11 | A10 | A9 | A8 | A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 |
SPI_MISO

READ REGISTER

Tc

SPI_CLK
SPI_CS
SPI_MOSI | C7 | C6 | C5 | C4 | C3 | C2 | C1 | C0 | A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 |
SPI_MISO | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |

WRITE REGISTER

SPI_CLK

SPI_MOSI | C7 | C6 | C5 | C4 | C3 | C2 | C1 | C0 | A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
SPI_MISO

Tc

SPI_CLK
SPI_CS
SPI_MOSI | C7 | C6 | C5 | C4 | C3 | C2 | C1 | C0 | A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 |
SPI_MISO

ONLY COMMAND

SPI_CLK
SPI_CS
SPI_MOSI | C7 | C6 | C5 | C4 | C3 | C2 | C1 | C0 |
SPI_MISO

9.   Time parameter

Variables	Time (MAX)	Time (MIN)	Definition	Note
Td1	-	1us		
Td2	-	20us		20us/1byte
Td3	-	4us		
Td4	-	2ms		
Td5	-	10ms		

10.   FLASH space

MAIN area:

   Total 32k bytes

Address width 16bits, data width 8 bits

Every address contain 1 bytes data

Flash has 64 pages

One page = 512 bytes

PAGE ADDRESS TABLES

IFREN	Page(Dec)	Page Size(Byte)	Address[16:0]	Flash Type
1	INFO	256	00000 – 000FF	Information
1	INFO	256	00100 – 001FF	
0	0	512	00000 – 001FF	Main Flash Memory
0	1	512	00200 – 003FF	
0	2	512	00400 – 005FF	
0	3	512	00600 – 007FF	
0	:	:	:	
0	:	:	:	
0	:	:	:	
0	:	:	:	
0	:	:	:	

Table 2. Memory address map

11. Operate Flash

Flash has information place and main flash memory。 If you want to operate the information memory，you have set wp_reg1=0xA5(wp_reg1 address is 8'h02) and wp_reg0=0xC3(wp_reg1 address is 8'h03),and we have also set control_reg[5:4]=01 (control_reg address is 8'h00). otherwise,don't do that.

you have to set Write_miso_oe_reg [0]=0x01 to enable that it can receive data from spi_miso pin .

we can control The address 0x7ff8 's byte in flash memory. it may be has some meaning.

The byte maybe 0xff,0x5a,0x35.

0Xff	Write enable \ read enable\ erase enable
0x5a	Write disable\ read enable\ erase disable
0x35	Write disable\ read disable\ erase disable
Other	Write enable\ read disable\ erase enable

Q: How to set 0x7ff8's value ?

A: 1. Get code.bin

    2.change code.bin's 0x7ff8 value (default is 0xff)

    3.do crc_change ,get code_crc.bin, the crc value is the last four bytes in code_crc.bin

Membist check : send command 0x15,wait for 10ms. Read status register(address is 0x00).

If reg00[7] is 1,means pass.IF reg00[6] is 1,means fail.

CRC_check; send command 0x14,wait for 200us. Read status register(address is 0x00).

If it is 1.means pass. Otherwise fail.