Application Report
SLAA281C–November 2005–Revised August 2018

Interfacing MSP430™ MCUs With MMC or SD Flash Memory Cards

MSP430 Applications

ABSTRACT

This application report and the associated source code files demonstrate a serial peripheral interface (SPI) between the MSP430F1612 microcontroller (MCU) and an MMC or SD flash memory card that used in SPI mode. The provided information can be used with any MSP430™ MCU with a hardware SPI interface.

The sample software described in this application report can be downloaded from http://www.ti.com/lit/zip/slaa281.

Contents

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1 Hardware Description

The MSP430F1612 communicates with the MMC or SD card through the SPI interface. SPI is a fast and efficient protocol that allows for simultaneous bidirectional data transfer. Serial data is transmitted and received by the MSP430 MCU using the USART module in SPI mode. Figure 1 shows the hardware interconnection for the master-slave configuration operating on a single supply voltage.

The associated MSP430F1612 pins P5.3 and P5.4 are configured as GPIO to control the chip-select pin and read the memory card detect signal. The USART1 hardware peripheral of the MSP430F1612 is configured in the 3-pin SPI mode. Pins P5.1, P5.2, and P5.3 of the MSP430 MCU provide the SIMO1, SOMI1, and UCLK1 interface to the MMC card.

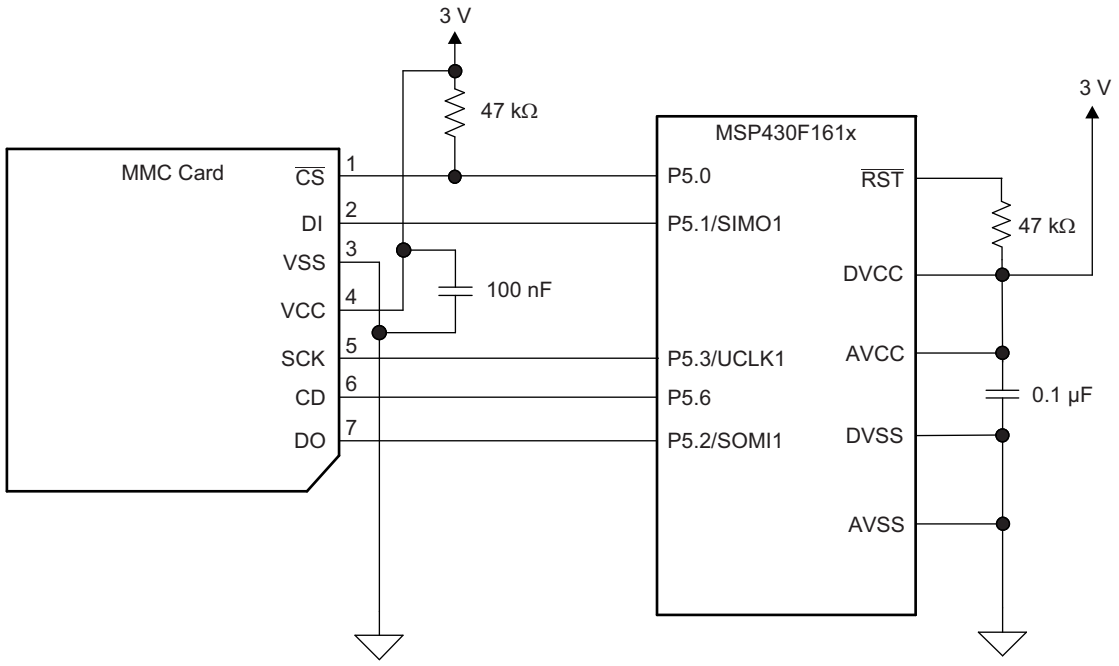

Figure 1. Connection Between MSP430 MCU and MMC Card

2 Software Description

The code associated with this application report is designed as a driver set for communication between an MSP430 MCU and an MMC card or an SD card through the SPI bus as described in Section 1. The code is written modularly and can be reused easily. Only a subset of the available card commands is used, based on the limitations of the SPI interface and the secure functions of the SD card. This sample code can be downloaded from http://www.ti.com/lit/zip/slaa281.

An example main() function shows the proper use of the driver functions.

1. This function initializes the MSP430F1612 in the 3-pin SPI mode with the function mmcInit().
2. The MCU polls until an MMC card is detected and then tries to read the device memory size.
3. The MCU prepares a buffer with 512 bytes of data and writes it to two different sectors of the card.
4. The MCU reads the data that was written to each memory segment.

Uncomment the following line of code to use the MSP430F1612 DMA module for data transmission between the MCU and the MMC card, which results in higher communication speed and less CPU load.

```
//#define withDMA
```

If you adapt the software to a different USART or a different device in which the USART is connected to other port pins, modify the following functions for the correct settings:

- void initSPI (void)
- char mmcInit (void)
- mmc.h file

3 Function Description

3.1 char mmcInit (void);

Initialize the port, SPI, and the MMC card. You might need to adjust this routing if the library to adapt it to another type of MSP430 MCU or to another USART module. Also, some of the control signals can be set to a different port, if necessary.

Parameter:	None	
Return:	Status	Error or success code

3.2 char mmcping(void);

Check if MMC card is present.

Parameter:	None	
Return:	Status	Error or success code

3.3 void mmcSendCmd (const char cmd, unsigned long data, const char crc);

Send a command to the MMC card.

Parameter:	cmd	Command that should be sent to the MMC card
	data	Data for the command
	crc	Checksum for the command
Return:	None	

3.4 char mmcGoIdle();

Set the MMC card in idle mode to save current.

Parameter:	None	
Return:	Status	Error or success code

3.5 char mmcSetBlockLength (const unsigned long);

Set the MMC block length of count = 2^n byte. Normally this command is not required. The default block length is 512 bytes.

Parameter:	Block Length of count = 2^n Byte	
Return:	Status	Error or success code

3.6 char mmcReadBlock(const unsigned long address, const unsigned long count, unsigned char *pBuffer);

```
#define mmcReadSector(sector, pBuffer) mmcReadBlock(sector × 512, 512, pBuffer)
```

Read a *size* byte big block beginning at the address.

Parameter:	address	Start address of data to read on the card
	count	Number of bytes to read
	pBuffer	Pointer to read buffer
Return:	Status	Error or success code

3.7 char mmcWriteBlock (const unsigned long address, const unsigned long count, unsigned char *pBuffer);

`#define mmcWriteSector(sector, pBuffer) mmcWriteBlock(sector × 512, 512, pBuffer).`

Write a 512-byte big block beginning at the (aligned) address

Parameter:	address	Start address of data to write on the card
	count	Number of bytes to write
	pBuffer	Pointer to write buffer
Return:	Status	Error or success code

3.8 char mmcReadRegister (const char cmd_register, const unsigned char length, unsigned char *pBuffer);

Read the register *arg1* with length *arg2* (into the buffer).

Parameter:	cmd_register	Register to read
	length	Number of bytes to read
	pBuffer	Pointer to read buffer
Return:	Status	Error or success code

3.9 unsigned long mmcReadCardSize(void);

Read the card size from the CSD register.

Parameter:	None
Return:	Detected card size

4 References

1. MSP430F15x, MSP430F16x, MSP430F161x Mixed-Signal Microcontrollers
2. MSP430x1xx Family User's Guide
3. *SanDisk MultiMediaCard Product Manual* (SanDisk, 2001)

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from March 14, 2008 to August 24, 2018	Page
• Editorial and format changes throughout document	1

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