SmartFusion2 SoC FPGA - SPI Master Programming

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Purpose

This application note describes how to use the serial peripheral interface (SPI) Master Programming mode on SmartFusion®2 system-on-chip (SoC) field programmable gate array (FPGA) Development Kit board DVP-102-000400-001 Rev C.

Note: Rev A and Rev B Development Kit Board are not supported.

Two software utilities, SPI_Memory.exe and SetMuxes.exe, are described in this document. The SPI_Memory.exe is used to program Atmel® AT25DF641 and SetMuxes.exe is used to configure the multiplexers on the Development Kit board to either perform SPI Memory Programming or initiate SPI Master Programming.

Introduction

SPI Master Programming mode, also known as auto-update or reflash is one of the programming methods available to program SmartFusion2 devices. Refer to the SmartFusion2 Programming User's Guide for more information on the available programming modes. On power-up or resetting the device with FLASH_GOLDEN_N pin asserted (driven low), the SmartFusion2 device configures the dedicated SPI port to operate in Master mode. It also reads the attached external SPI memory device from address zero. Auto programming is executed if a valid programming image is found. Figure 1 shows a high level system design to execute auto programming.

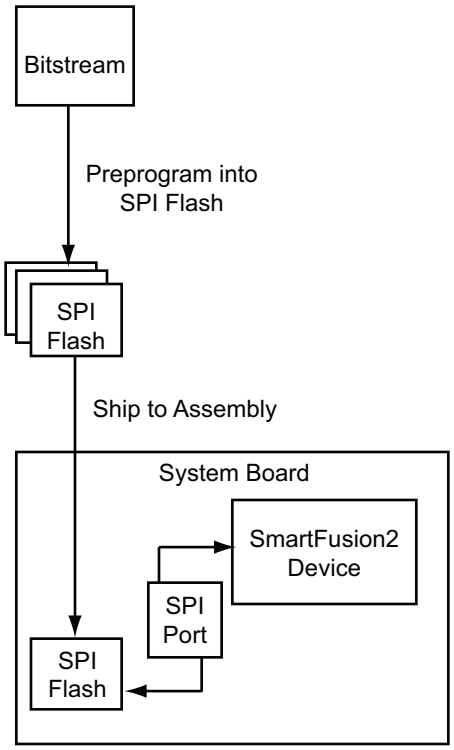

***Figure 1* • Auto Programming (SPI- Master) Mode**

Development Kit Board Programming Circuit Design Description

The Development Kit board programming circuitry has an on board FT4232H module from Future Technology Devices International (FTDI). This module is a universal serial bus (USB)-to-serial interface converter. For more information on FT432H module, see FTDI website at http://www.ftdichip.com/Products/Modules/DevelopmentModules.htm. This module is connected to the M2S dedicated SPI port and the SPI memory device using the multiplexers. The multiplexers can then be configured either manually or through SetMuxes.exe utility described below to program the Atmel SPI memory device or to initiate an auto-programming operation. The Development Kit board is designed in this fashion to program the SPI memory device on board through the FTDI chip. Figure 2 shows how the multiplexers are connected.

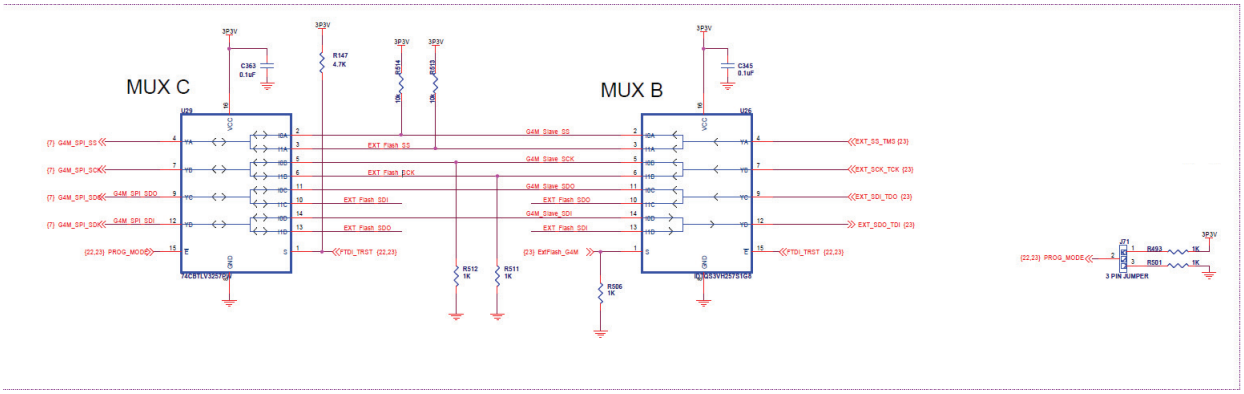

***Figure 2* • Connection of Multiplexers**

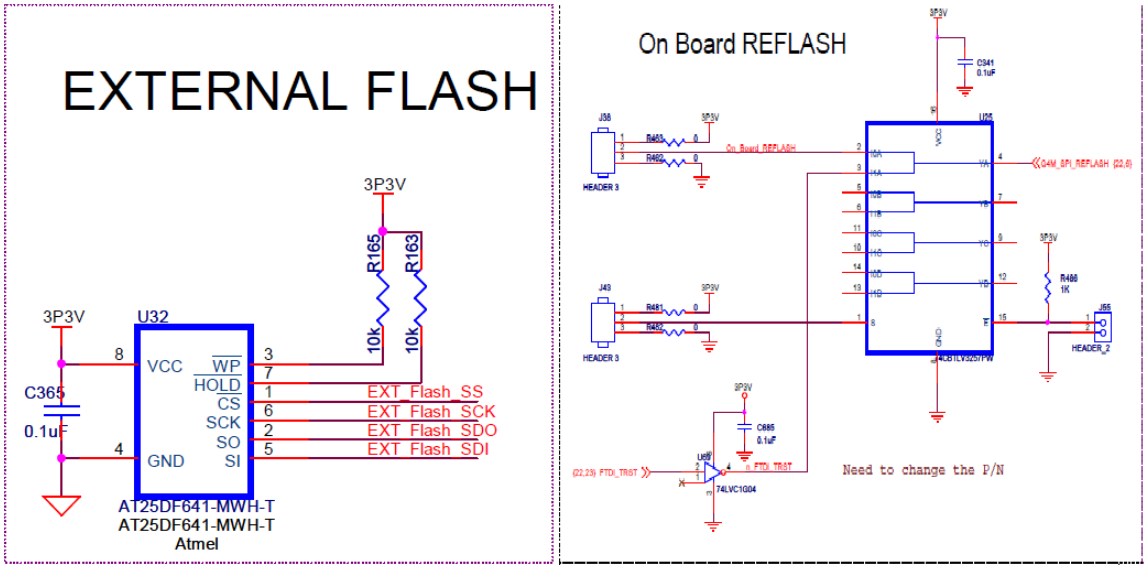

***Figure 3* • Development Kit Board Programming Circuit - Auto Programming Module**

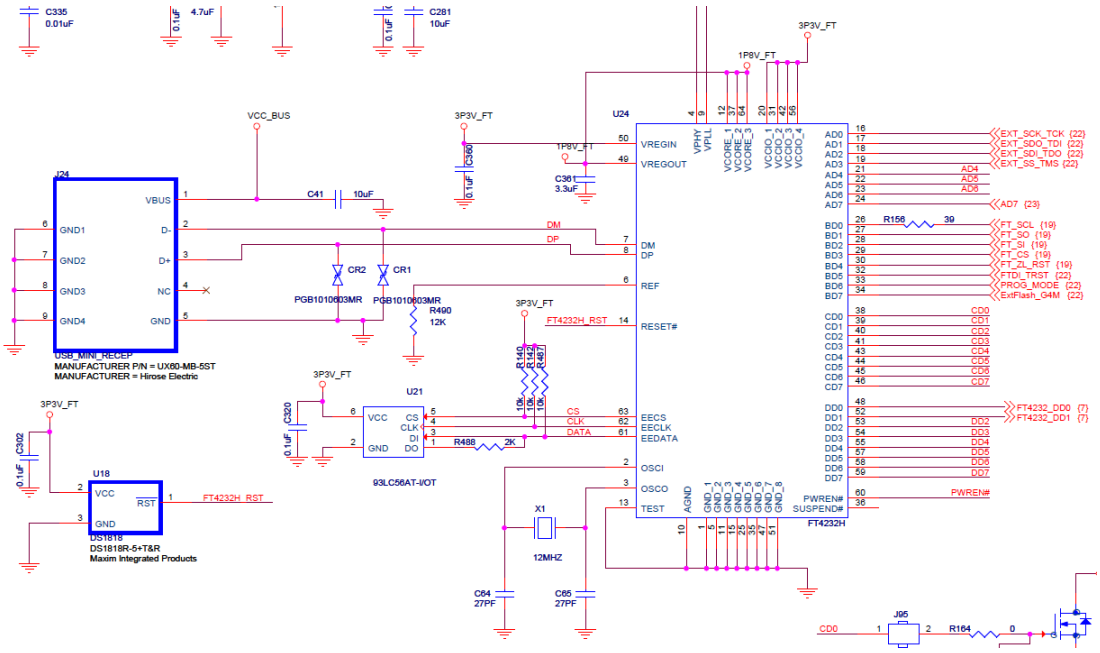

***Figure 4* • Development Kit Board Programming Circuit - FT4232H Module**

Note: Some of the FT4232H I/O pins control the enable and select signals of the multiplexers. SetMuxes.exe configures these pins to either perform the SPI memory programming manually or initiate auto-programming.

Programming the SPI Master

The following steps describe how to program the SPI master.

1. Set the jumpers on the Development Kit board as:
   - J43 (Pin 1 - Pin 2)
   - J55 (Pin 1 - Pin 2)
   - J70 (Pin 2 - Pin 3)
2. Install the FTDI drivers based on the operating system as described in the FTDI driver installation guide available at: http://www.ftdichip.com/Support/Documents/InstallGuides.htm.
3. Copy the following files into a local directory on your PC.
   - FTCJTAG.dll: Used for interfacing FT2232 to devices using the JTAG protocol.

Note: Click the file name to download a ZIP file containing the library.

   - libMPSSE.dll: This library has been created to aid the implementation of I2C designs using FTDI devices which incorporate the FTDI MPSSE.
   - SetMuxes.exe: Refer "Appendix B - SetMuxes Utility"for more information.
   - SPI_Memory.exe: Refer "Appendix A - SPI Memory Utility"for more information.
   - Click here to download a sample demo project containing both the exe files.
4. Copy the programming file (.spi) to a local directory on the PC. Use one of the .spi files included in this demo package or generate a design and export it through Libero® System-on-Chip (SoC) software. For more information on how to use Libero software, refer http://www.actel.com/download/software/liberosoc/default.aspx.
5. Open the Command Prompt and navigate to the directory where the files are saved.
6. Connect the Development Kit board mini USB (J24) to the PC.
7. Power-up the Development Kit board.

8. In the command prompt, type:

   SetMuxes MEM

   This application sets the multiplexers for the FTDI chip to access the Atmel memory device on the board. Figure 4 shows an example message on successful setting-up of the multiplexers.

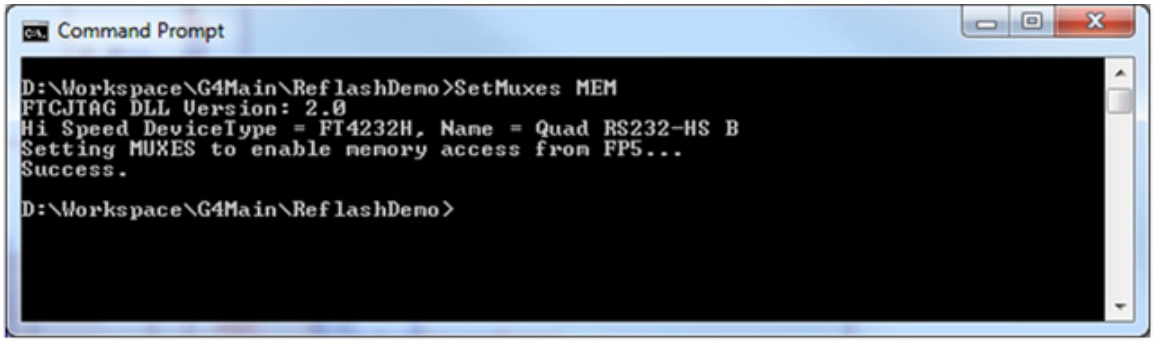

***Figure 5* • SetMuxes MEM**

9. In the command prompt, type:

   SPI_Memory -aprogram <file name>.spi

   This updates the Atmel spi memory device, as shown in Figure 6.

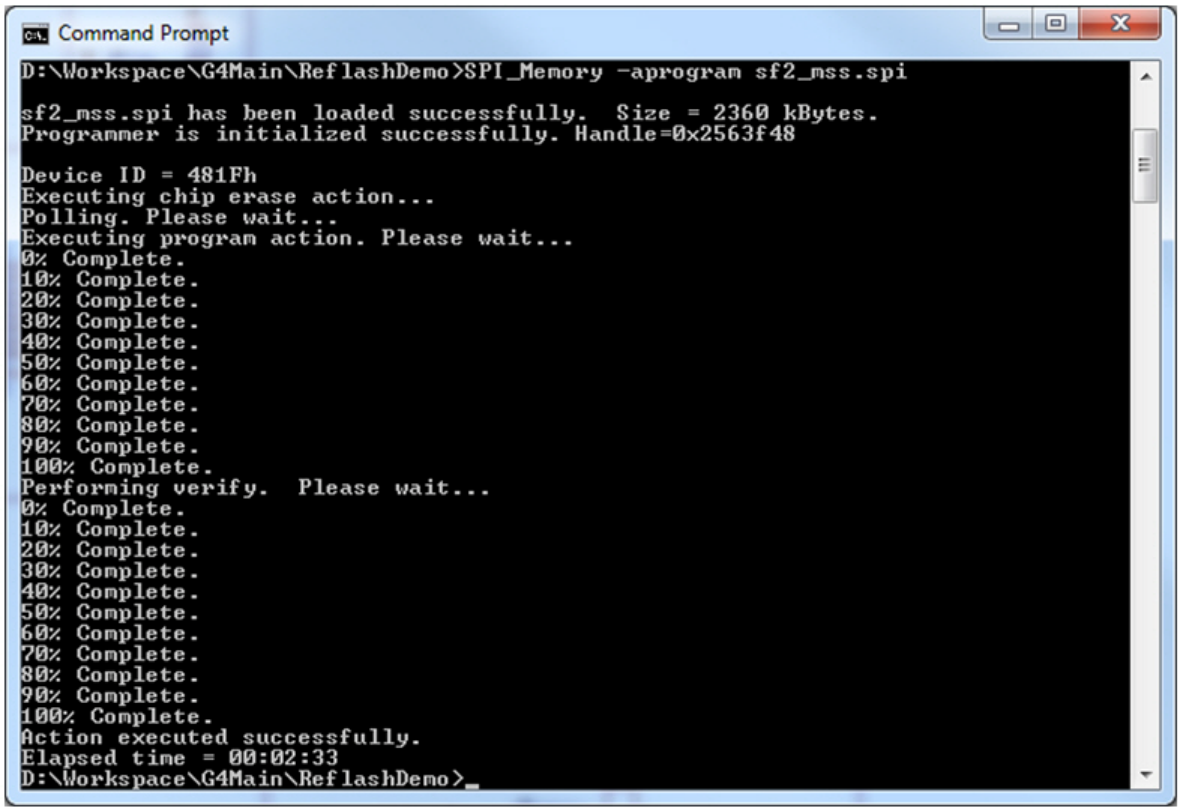

***Figure 6* • aprogram <file name>.spi**

10. In the command prompt type the following:

    SetMuxes REF

This command sets the multiplexers for the M2S chip to access the Atmel memory device on the board and initiates reflash, as shown in Figure 7. The M2S device functions with a delay of approximately a minute. The functioning is based on the design that you programmed.

Note: With this configuration, any subsequent resets to the device or board power cycle initiate the reflash operation again.

***Figure 7* • SetMuxes REF**

11. In the command prompt type the following:

    SetMuxes SPI

    This application sets the multiplexers for the FTDI chip to access the M2S device, as shown in Figure 8.

***Figure 8* • SetMuxes SPI**

List of Changes

The following table lists critical changes that were made in the current version of the document.

Revision	Changes in Current Version (51900145-2/2.08*)	Page
Revision 1 January 2014	Updated the section "Programming the SPI Master"(SAR 53223).	4

Appendix A - SPI Memory Utility

SPI_Memory.exe is a standalone command line utility that uses the FTDI chip to program the SPI file into the Atmel AT25DF641 memory device used in the Development Kit board. This supports the following platforms:

- Windows XP
- Windows Vista
- Windows 7

Usage: spi_memory [options] <filename> Available options:

- -h : show help message
- -a<action>: Specify action name as follows:
  - read_id: Read device ID.
  - Blank: Checks to see if device is in erased state.
  - Erase: Erases the entire device.
  - Program: Programs the content of the file into the device starting at address 0.
  - Verify: Verifies the content of the device against the file.
  - Read: Reads the content of the device and saves it in ReadBuffer.bin.

Appendix B - SetMuxes Utility

SetMuxes.exe configures the multiplexers on the Development Kit board based on the desired operation. This supports the following platforms:

- Windows XP
- Windows Vista
- Windows 7

Usage: SetMuxes [options]

MEM: Configures the multiplexers to enable FTDI connection to the SPI memory device on the dedicated SPI port.

REF: Configures the multiplexers to connect the M2S device to the SPI memory device and initiate reflash.

SPI: Configures the multiplexers to connect the M2S device to FTDI for SPI- Slave programming.

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51900269-1/01-14