

# Digilent PmodSF™ 16Mbit SPI Serial Flash Memory Module Reference Manual

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## Overview

The Digilent PmodSF is a Digilent Pmod™ peripheral module that provides 16Mbit (2Mbyte) of flash ROM memory. This memory is accessed through an SPI (Serial Peripheral Interface) compatible serial interface. This module provides easily accessible non-volatile memory storage for various Digilent programmable logic and embedded control system boards.

Features include:

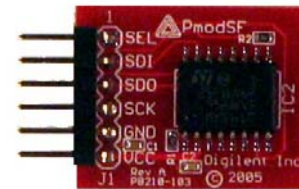
- ST Microelectronics M25P16 serial flash ROM integrated circuit
- a 6-pin header Pmod interface connector
- more than 20 year data retention
- very low power consumption
- small form factor (0.80" x 1.00").

## Functional Description

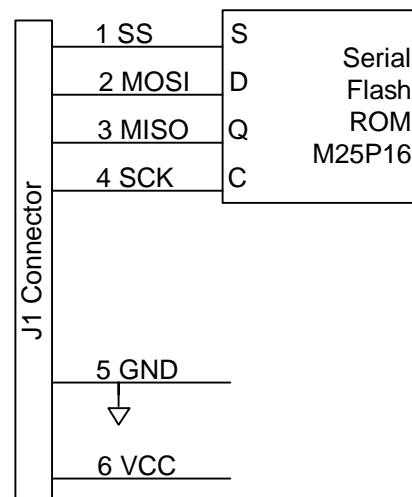
The flash memory on the PmodSF is provided by an ST Microelectronics M25P16 integrated circuit. This memory is organized as 32 sectors of 65536 (64K) bytes each. Each sector is organized as 256 pages of 256 bytes each.

Flash memory must be erased before new data can be written. The M25P16 allows for a bulk erase, to erase the entire memory, or individual sectors may be erased independently. After a sector has been erased, individual bytes within the sector can be written or complete pages may be written as a single write operation.

Flash memory will eventually wear out after many erase/reprogram cycles. The M25P16 supports more than 100,000 erase/program cycles per sector before the memory wears out. Normally flash memory wear-out is not an



**Figure 1**  
**Digilent PmodSF**



**Figure 2**  
**Block Diagram**

issue in routine operation. However, be aware that bugs in the control software may inadvertently cause many erase/program cycles to happen quickly. This could result in premature wear-out of the memory. Sending commands and data to the module via the SPI interface accesses the flash memory on the PmodSF.

The SPI interface standard uses four signal lines. These are SS, slave select; MOSI, master out slave in; MISO, master in slave out;

and SCK, serial clock. These signals map to the following signals on the M25P16 flash ROM part as described in the ST Microelectronics data sheet: SS corresponds to the Chip Select signal, S; MOSI corresponds to Serial Data Input, D; MISO corresponds to Serial Data Output, Q; and SCK corresponds to the Serial Clock signal, C. See Table 1 for a description of the pins on Pmod interface connector J1.

The M25P16 flash ROM IC provides additional inputs called “Hold” and “Write Protect” that are not used on the PmodSF module. These signals are held in the inactive state on the module.

A system board interacts with the PmodSF module by sending commands over the SPI interface. Depending on the command sent, the system board will then send memory data to, or receive memory data from, the module.

The M25P16 provides commands to perform sector erase, bulk erase, page program, and write commands as well as other miscellaneous commands. Please refer to the ST Microelectronics data sheet for the M25P16 IC for detailed information on the operation of this integrated circuit.

The PmodSF is designed to work with either Digilent programmable logic or Digilent embedded control system boards. Some system boards, such as the Nexys, Basys and Cerebot boards, have 6-pin header connectors into which the PmodSF will connect directly.

Other Digilent system boards may need a Digilent Module Interface Board (MIB) and a 6-pin cable to connect to the PmodSF. The MIB plugs into the system board and the cable connects the MIB to the PmodSF.

The PmodSF requires a 3.3V supply voltage. This power supply voltage is available on all Digilent system boards and is provided as part of the 6-wire Pmod interface standard. Digilent system boards that provide Pmod interface connectors, allow jumper selection of the power supply voltage being provided to the Pmod. Ensure that the system board is

jumpered to provide 3.3V to the module before applying power to the board.

For detailed information on the M25P16, see the ST Microelectronics data sheet available at [www.st.com](http://www.st.com).

**Table 1: Connector J1 Signals**

Pin	Signal
1	SS (S)
2	MOSI (D)
3	MISO (Q)
4	SCK (C)
5	GND
6	VCC