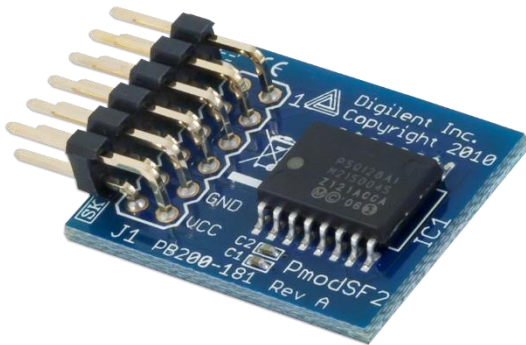# PmodSF2™ Reference Manual

**Revised February 23, 2016**
**This manual applies to the PmodSF2 rev. A**

## Overview

The Digilent PmodSF2 provides 16MB of serial phase change memory (PCM).



*The PmodSF2.*

Features include:

- 16MB of serial phase change memory (PCM)
- 128Mbit, quad/dual/single serial interface
- More than 1,000,000 write cycles
- 8 Super Page programming regions for a total of 128 sectors
- Small PCB size for flexible designs 1.0" × 0.8" (2.54 cm × 2.0 cm)
- 12-pin Pmod connector with SPI interface
- Library and example code available in resource center

## 1    Functional Description

The PmodSF2 utilizes Micron® P5Q PCM to provide easily accessed non-volatile memory to system boards. As PCM supports bit-alterable page writes, it lasts much longer than flash memory and can support over 1,000,000 page write cycles per sector.

## 2    Interfacing with the Pmod

The PmodSF2 communicates with the host board via the SPI protocol. By bringing the Chip Select line low, users may issue a single byte instruction code to memory chip. A table of available commands taken from the P5Q datasheet is provided below.

| Instruction | Description | One-byte Instruction Code | Number of Address Bytes | Number of Dummy Bytes | Number of Data Bytes |
|---|---|---|---|---|---|
| WREN | Write Enable | 0x06 | 0 | 0 | 0 |
| WRDI | Write Disable | 0x04 | 0 | 0 | 0 |
| RDID | Read Identification | 0x9F | 0 | 0 | 1 to 3 |
|  |  | 0x9E | 0 | 0 | 1 to 3 |
| RDSR | Read Status Register | 0x05 | 0 | 0 | 1 to ∞ |
| WRSR | Write Status Register | 0x01 | 0 | 0 | 1 |
| READ | Read Data Bytes | 0x03 | 3 | 0 | 1 to ∞ |
| FAST_READ | Read Data Bytes at Higher Speed | 0x0B | 3 | 1 | 1 to ∞ |
| DOFR | Dual Output Fast Read | 0x3B | 3 | 1 | 1 to ∞ |
| QOFR | Quad Output Fast Read | 0x6B | 3 | 1 | 1 to ∞ |
| PP | Page Program (Legacy) | 0x02 | 3 | 0 | 1 to 64 |
|  | Page Program (Bit-alterable write) | 0x22 | 3 | 0 | 1 to 64 |
|  | Page Program (On all 1s) | 0xD1 | 3 | 0 | 1 to 64 |
| DIFP | Dual Input Fast Program (Legacy) | 0xA2 | 3 | 0 | 1 to 64 |
|  | Dual Input Fast Program (Bit-alterable write) | 0xD3 | 3 | 0 | 1 to 64 |
|  | Dual Input Fast Program (On all 1s) | 0xD5 | 3 | 0 | 1 to 64 |
| QIFP | Quad Input Fast Program (Legacy) | 0x32 | 3 | 0 | 1 to 64 |
|  | Quad Input Fast Program (Bit-alterable write) | 0xD7 | 3 | 0 | 1 to 64 |
|  | Quad Input Fast Program (On all 1's) | 0xD9 | 3 | 0 | 1 to 64 |
| SE | Sector Erase | 0xD8 | 3 | 0 | 0 |
| BE | Bulk Erase | 0xC7 | 0 | 0 | 0 |
| DP | Deep Power-down | 0xB9 | 0 | 0 | 0 |

*Table 1. Available commands from the P5Q datasheet.*

The memory address bits range from 0x000000 to 0xFFFFFF with each individual page consisting of 64 bytes a piece. Users that wish to simply use the memory module without concerning themselves with the dual/quad input output communication may use the same library that is available for the PmodSF2 without any issue.

| Pin | Signal | Description |
|-----|--------|-------------|
| 1 | ~CS | Chip Select |
| 2 | MOSI/DQ0 | Master-Out-Slave-In |
| 3 | MISO/DQ1 | Master-In-Slave-Out |
| 4 | SCK | Serial Clock |
| 5 | GND | Power Supply Ground |
| 6 | VCC | Power Supply (3.3V) |
| 7 | NC | Not Connected |
| 8 | W/DQ2 | Write Protect |
| 9 | HLD/DQ3 | Hold |
| 10 | NC | Not Connected |
| 11 | GND | Power Supply Ground |
| 12 | VCC | Power Supply (3.3V) |

*Table 2. Pinout description table.*

Any external power applied to the PmodSF2 must be within 2.7V and 3.6V; it is strongly recommended that Pmod is operated at 3.3V.

# 3    Physical Dimensions

The pins on the pin header are spaced 100 mil apart. The PCB is 1 inch long on the sides parallel to the pins on the pin header and 0.8 inches long on the sides perpendicular to the pin header.