MSPM0 SPI module introduction

—— MSPM0 peripheral training series

Presented by Sal Ye

TEXAS INSTRUMENTS

MCU level overview

——MSPM0Lxx series

——MSPM0Gxx series

MSPM0L13x3/4/5/6
1.62 - 3.6V
-40 to 125 C

CPU
ARM Cortex-M0+
32 MHz

NVIC / 3-ch DMA

On-chip Memory

8, 16, 32 or 64 kB flash

2 or 4 kB SRAM

Data Integrity & Security

CRC accelerator (16 and 32 bit)

Programming & Debug

ARM SWD interface

ROM UART & I2C BSL

Power & Clocking

POR / BOR / SVS

Internal LF 32kHz (5%)

Internal HF 4-32MHz (1%)

Communication

UART w/ LIN (1)

UART (1)

SPI (1)

I2C (2) w/ FastMode+

IO

Up to 28 GPIO

Up to 2 low Ib OPA inputs

Precision Analog

12-bit SAR ADC 1Msps (1)

ULP/HS Comparator (1)

8-bit reference DAC (1)

Zero-drift chopper op-amps (2)

General purpose amp (1)

Internal ADC reference (2.5%)

Temperature sensor

Timers

General purpose 16-bit 2 CC (4)

Windowed watchdog

Leaded packages: SOT-16, VSSOP-20/28
No-lead packages: WQFN-16, VQFN-24/32

32 MHz MCU with up to 64kB flash, 32 pins, 12-bit ADC, dual zero-drift OPA/PGA, COMP

MSPM0G350x/310x/150x/110x
1.62 - 3.6V
-40 to 125 C

CPU
Arm Cortex-M0+
80 MHz

NVIC / MPU / 7-ch DMA

Accelerators

Math (DIV, SQRT, TRIG, MAC)

On-chip Memory

32, 64, or 128 kB flash [ECC]

16 or 32 kB SRAM [ECC]

Data Integrity & Security

CRC accelerator (16 and 32 bit)

AES256 accelerator + TRNG

Programming & Debug

ARM SWD interface

UART & I2C bootloader

Power & Clocking

POR / BOR / SVS

External LF 32kHz XTAL

External HF 4-48MHz XTAL

Internal LF 32kHz (3%)

Internal HF 4-32MHz (1%)

PLL (up to 80 MHz)

Communication

UART w/ LIN (1)

UART (3)

SPI (2)

I2C (2) w/ FastMode+

CAN-FD (1)

IO

Up to 60 GPIO

Precision Analog

12-bit ADC 4Msps (9-ch)

12-bit ADC 4Msps (8-ch)

Comparators w/ 8-bit DACs (3)

12-bit 1Msps buffered DAC (1)

Zero-drift chopper op-amps (2)

Internal reference (1.5%)

General purpose amp (1)

Temperature sensor

Timers

Advanced control 16-bit 4 CC (1)

Advanced control 16-bit 2 CC (1)

General purpose 32-bit 2 CC (1)

General purpose 16-bit 2 CC (2)

Low power 16-bit 2 CC (2)

Windowed watchdog (2)

Real-time clock (1)

Leaded packages: VSSOP-20/28, LQFP-48/64
No-lead packages: VQFN-24/32/48, nFBGA-64, WCSP-28

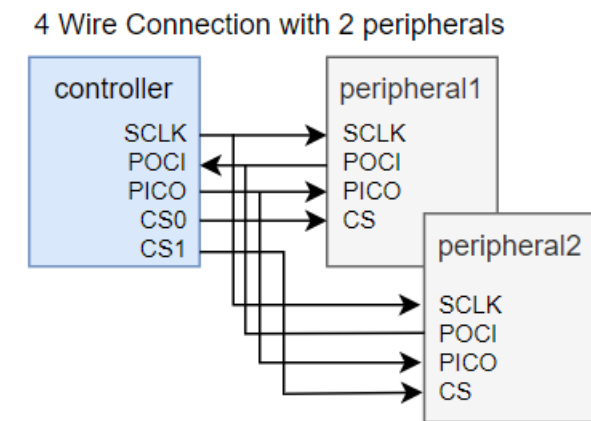*80 MHz MCU with up to 128kB flash, 64 pins, advanced analog, AES/TRNG, CAN-FD*
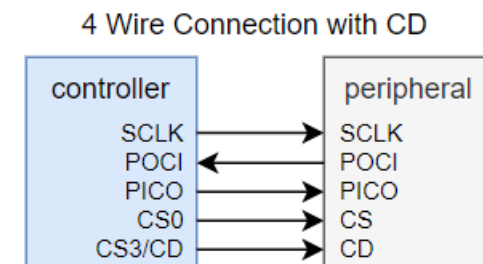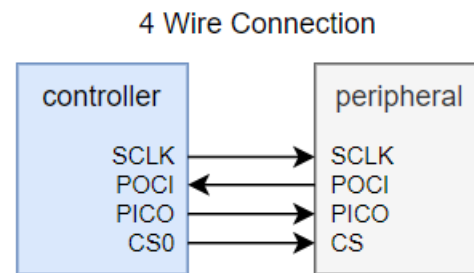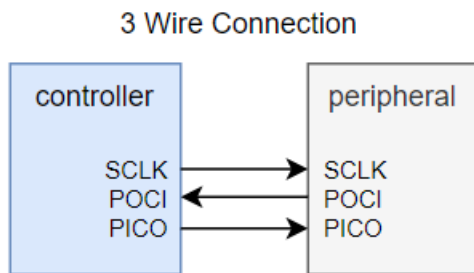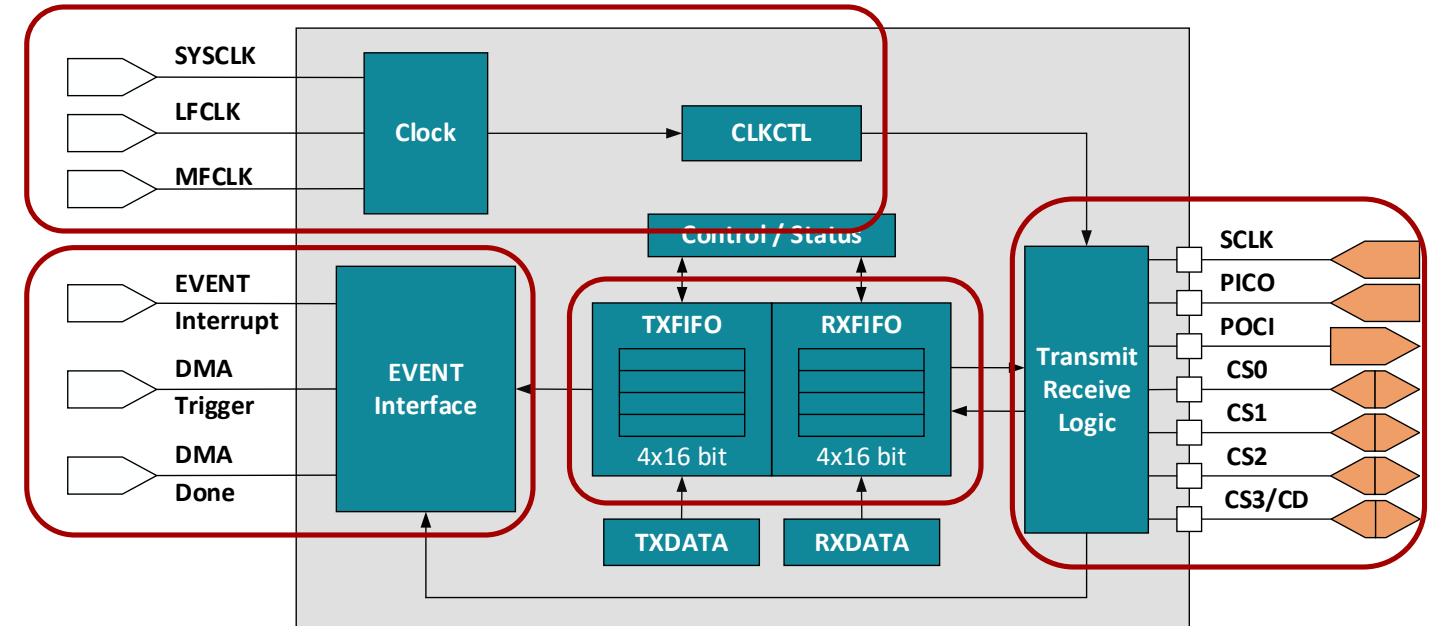
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MSPM0 SPI module introduction

Key Features

- Configurable as a controller or a peripheral
- Direct memory access controller interface (DMA)
- **Independent FIFOs** allowing up to 4 entries with 16-bit width
- Support **3/4 wire** connection and **multiply peripherals**
- Programmable data frame size from 4-bits to 16-bits (Controller Mode)
- Programmable data frame size from 7-bits to 16-bits (Peripheral Mode)
- Programmable SPI mode support Motorola SPI, MICROWIRE, or Texas Instruments format

Key Differences between G and L MCUs

MSPM0L130x SPI speed up to 16MHz
MSPM0G350x SPI speed up to 32MHz

3 Wire Connection

4 Wire Connection

4 Wire Connection with CD

4 Wire Connection with 2 peripherals

MSPM0 SPI module introduction

Key Features

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- Direct memory access controller interface (DMA)
- Independent FIFOs allowing up to 4 entries with 16-bit width
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- Programmable data frame size from **4-bits to 16-bits (Controller Mode)**
- Programmable data frame size from **7-bits to 16-bits (Peripheral Mode)**
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Key Differences between G and L MCUs

MSPM0L130x SPI speed up to 16MHz
MSPM0G350x SPI speed up to 32MHz

Control / Status

- SPI control register 0 – CTL0
  CTL0.DSS – **Data size select**, 4~16 bit data frame size

- SPI control register 1 – CTL1
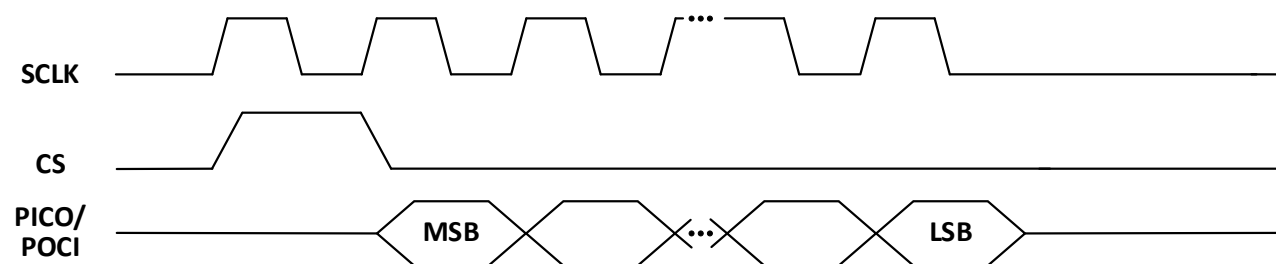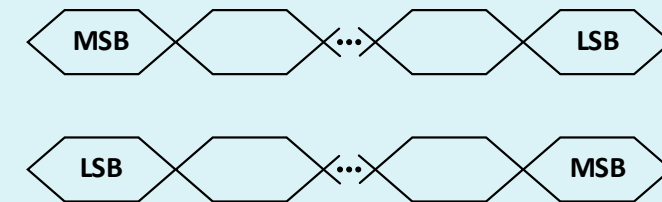 CTL1.MSB – **Controls the direction of the receive and transmit shift register**
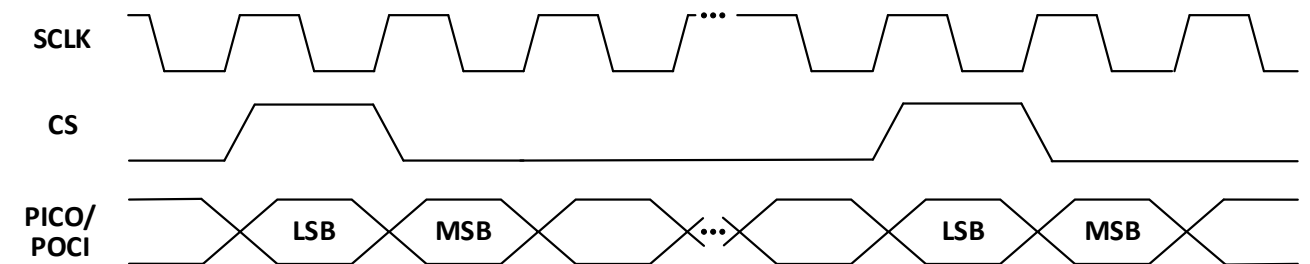

Fig1: Motorola SPI Format

Fig2: TI SPI Format

SPI module quick start

Academy

SPI introduction lab

Driverlib Examples

MSPM0G350x / MSPM0L13xx:

- spi_controller_command_data_control
- spi_controller_echo_interrupts
- spi_controller_internal_loopback_poll
- spi_controller_multibyte_fifo_dma_interrupts
- spi_controller_multibyte_fifo_poll
- spi_controller_register_format
- spi_controller_repeated_multibyte_fifo_dma_i...
- spi_peripheral_echo_interrupts
- spi_peripheral_multibyte_fifo_dma_interrupts
- spi_peripheral_multibyte_fifo_poll
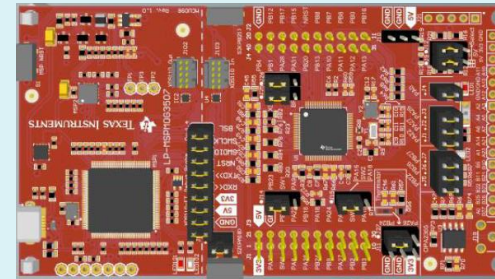- spi_peripheral_register_format

Related Links

MSPM0 online resource
MSPM0 Quick start guide
MSPM0 Sysconfig user's guide

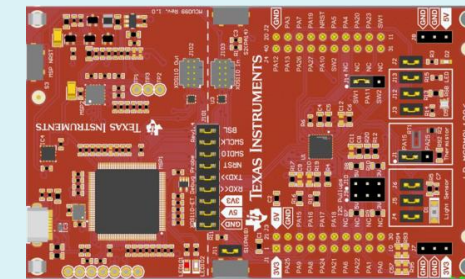MSPM0G350x datasheet
MSPM0L13xx datasheet
MSPM0Gxx technical reference manual
MSPM0Lxx technical reference manual

Launchpad

LP-MSPM0G3507   LP-MSPM0L1306

Sysconfig Entrance for SPI setting

I2C   **Step1:**   ⊕
MCAN   ⊕
SPI   1/1 ✅ ⊕
UART   ⊕
UART - LIN   ⊕
▶ TIMERS (3)
▶ DATA INTEGRITY (1)
▶ READ-ONLY (1)

Name   SPI_Demo
Selected Peripheral   SPI0

Quick Profiles   **Step2:**   ^

Basic Configuration   ^

Advanced Configuration   ^

Interrupt Configuration   ^

DMA Configuration   ^

PinMux   Peripheral and Pin Configuration   ^

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To find more MSPM0 training series, please visit:

- TI.com.cn
- WeChat (德州仪器公众号)
- Bilibili
- 21IC

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