ECE 372A Fall 2015 - Lecture 14

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Outline

SPI

Reference Material

Section 23 in the PIC24F Family Reference Manual
Section 17 in the PIC32MX Data Sheet

Clock Configuration

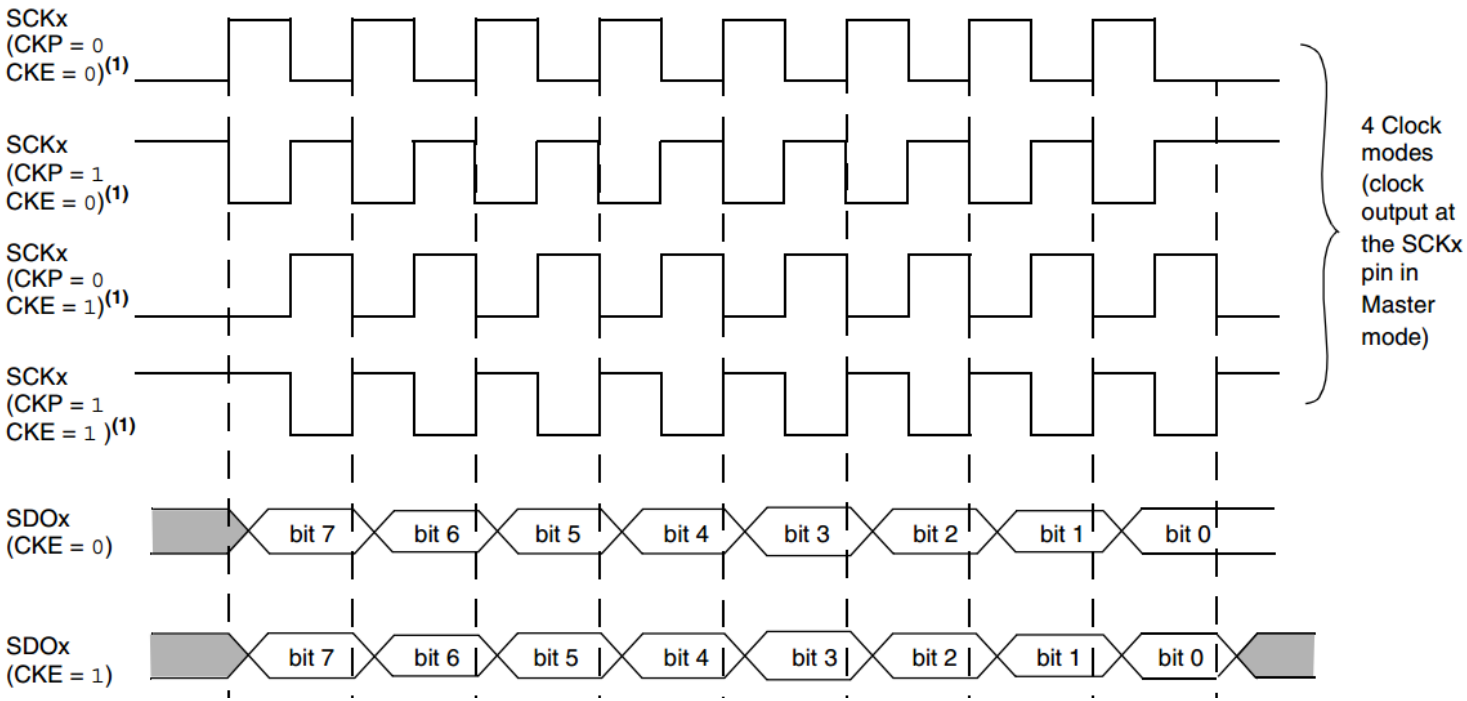
These two bits configure the clock mode.

bit 8 **CKE:** SPIx Clock Edge Select bit(1)
1 = Serial output data changes on transition from active clock state to Idle clock state (see bit 6)
0 = Serial output data changes on transition from Idle clock state to active clock state (see bit 6)

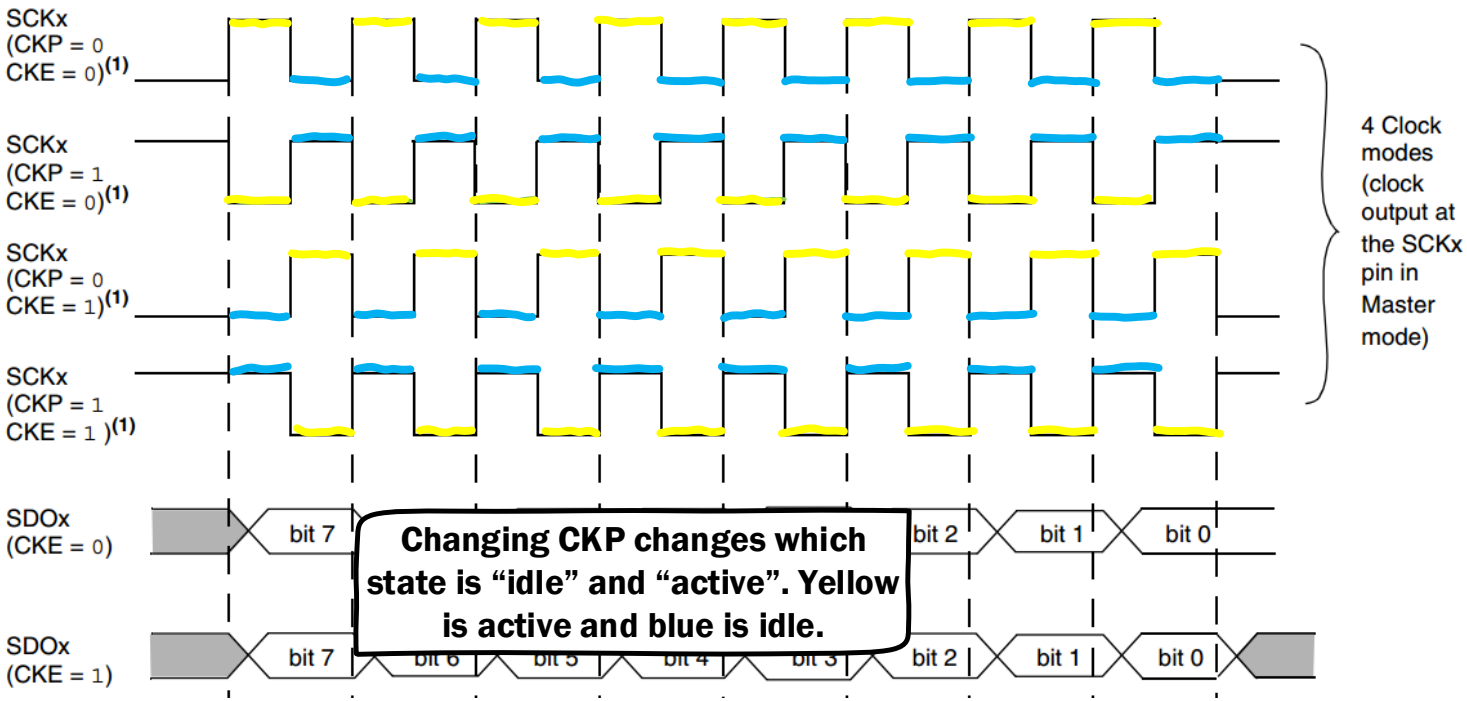
bit 7 **SSEN:** Slave Select Enable (Slave mode) bit
1 = $\overline{\text{SSx}}$ pin used for Slave mode
0 = $\overline{\text{SSx}}$ pin not used by module, pin controlled by port function

bit 6 **CKP:** Clock Polarity Select bit
1 = Idle state for clock is a high level; active state is a low level
0 = Idle state for clock is a low level; active state is a high level

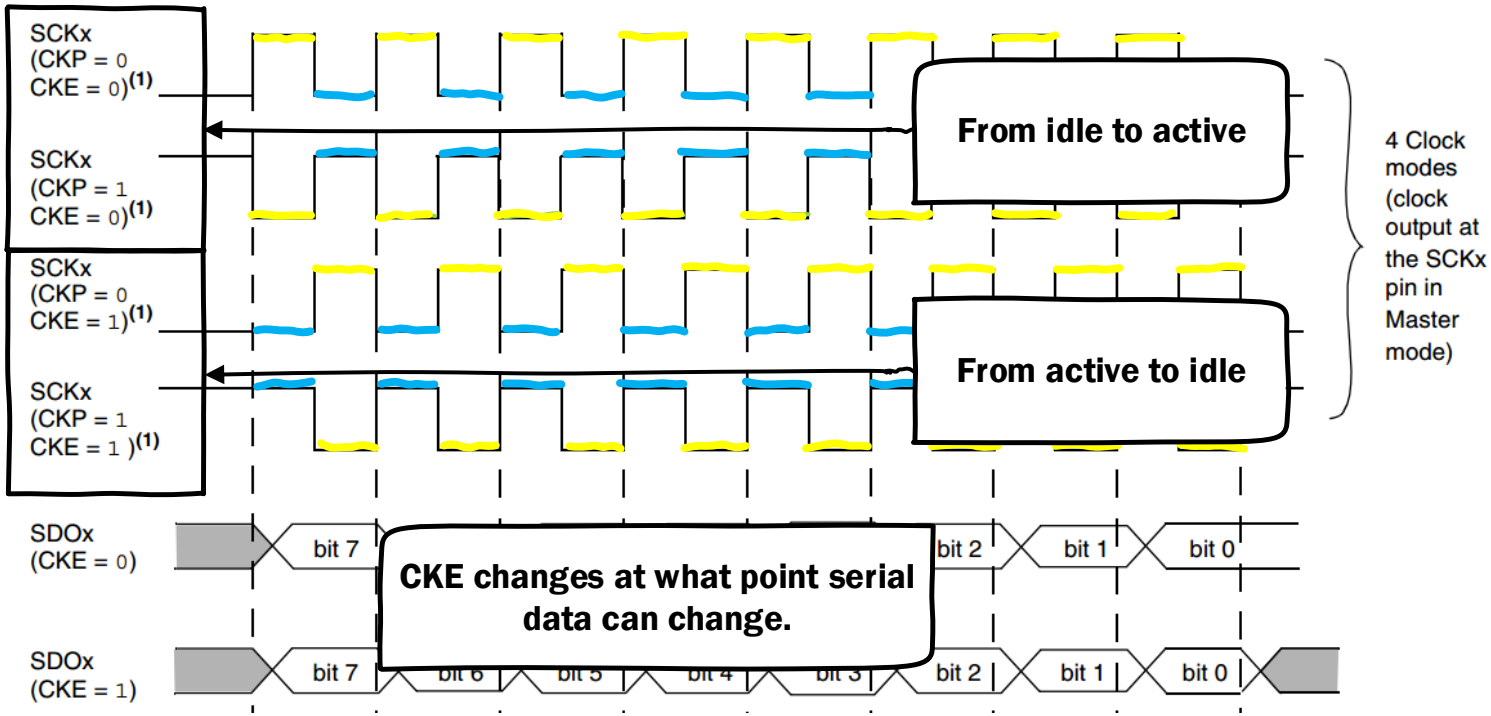
Clock Configuration



Clock Configuration



Clock Configuration



Clock Configuration

Accelerometer

1. CPOL is the same as CKP. CKE is the opposite of CPHA.

mode. The maximum SPI clock speed is 5 MHz with 100 pF maximum loading, and the timing scheme follows clock polarity (CPOL) = 1 and clock phase (CPHA) = 1. If power is applied to

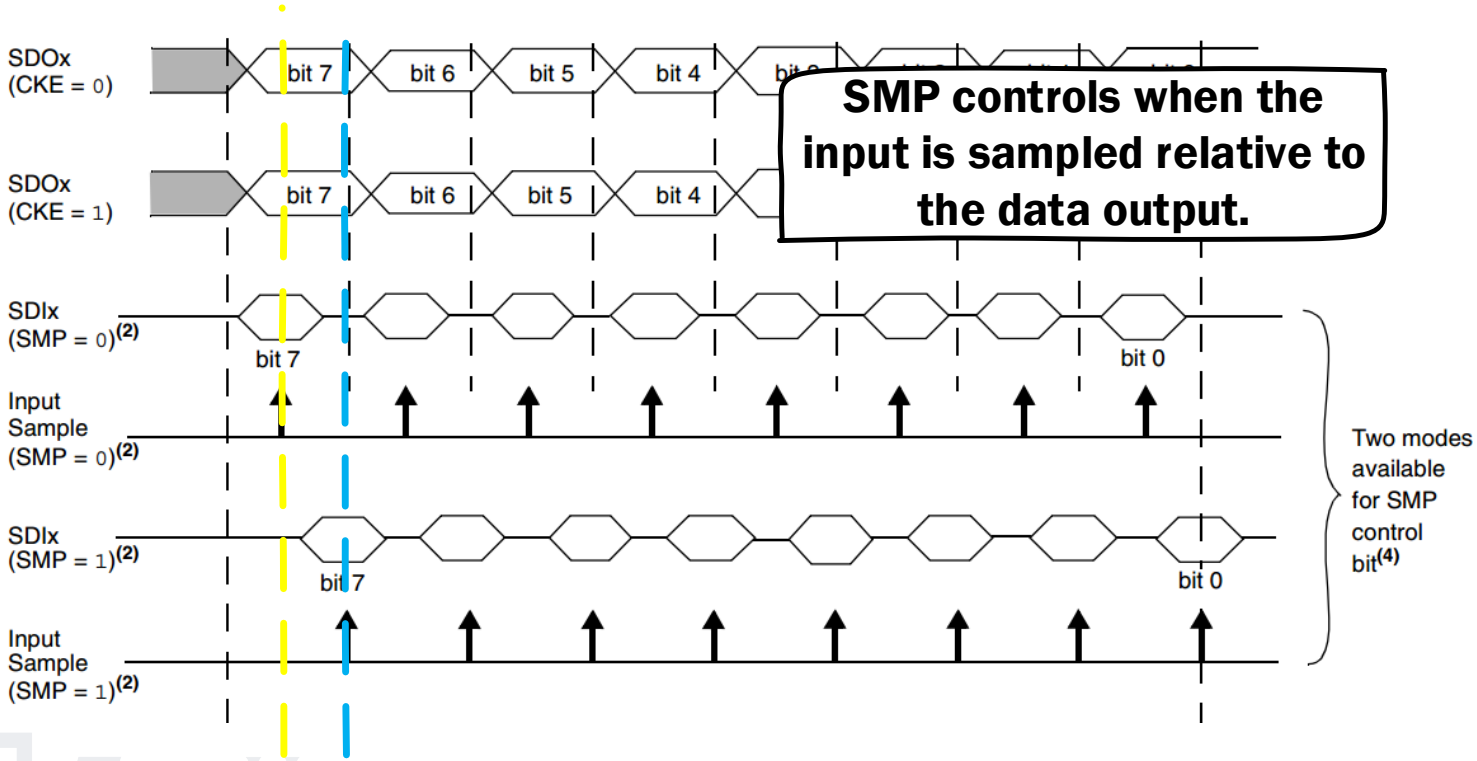
Clock Configuration

Accelerometer

1. CPOL is the same as CKP. CKE is the opposite of CPHA.
2. We use CKP $= 1$ and CKE $= 0$.

mode. The maximum SPI clock speed is 5 MHz with 100 pF maximum loading, and the timing scheme follows clock polarity (CPOL) = 1 and clock phase (CPHA) = 1. If power is applied to

Sample Configuration



Sample Configuration

Accelerometer

1. Output is slightly delayed from input
2. SMP = 1 is better.

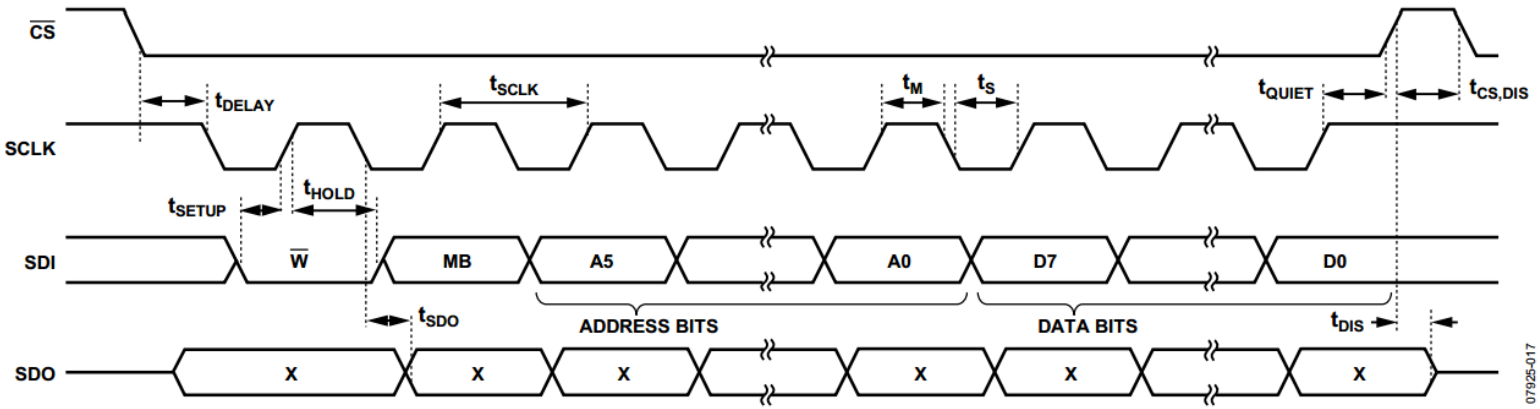


Figure 37. SPI 4-Wire Write

Using Slave Select

CS pin on the Accelerometer

1. To send data, we have to use slave select for CS.

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Using Slave Select

CS pin on the Accelerometer

1. To send data, we have to use slave select for CS.
2. We will drive this pin ourselves without the need to map the pin.
3. The issue is being able to drive it low once the transmission is finished.
4. We can wait for SPIxRXBF to be high. This means that we have received everything properly.

Writing

Accelerometer Write

1. First, a write bit and an address is necessary

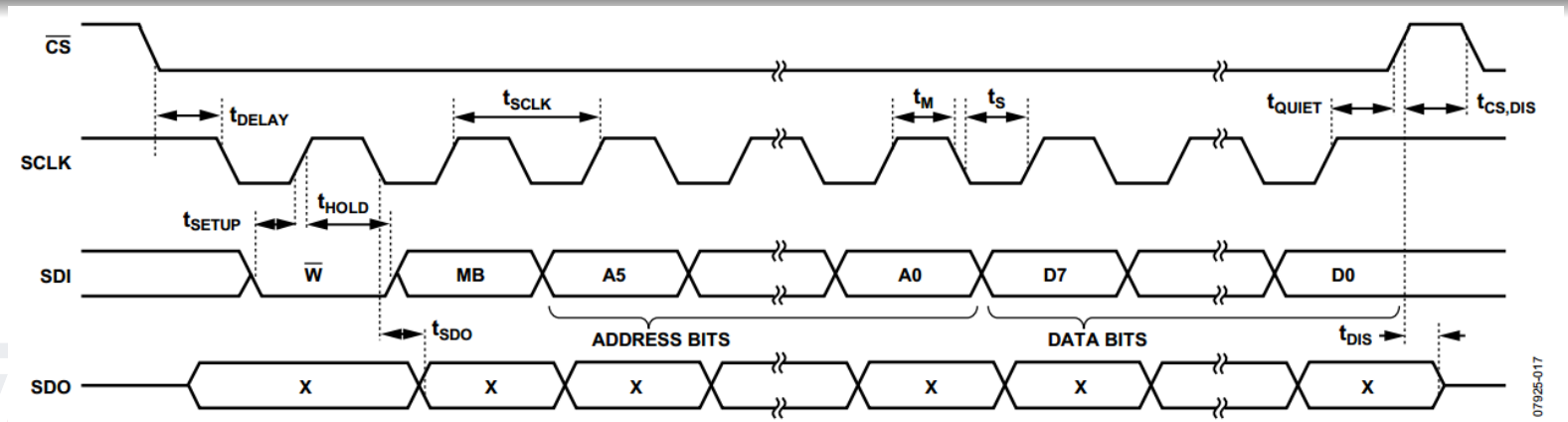

Figure 37. SPI 4-Wire Write

Writing

Accelerometer Write

1. First, a write bit and an address is necessary
2. Then we send data

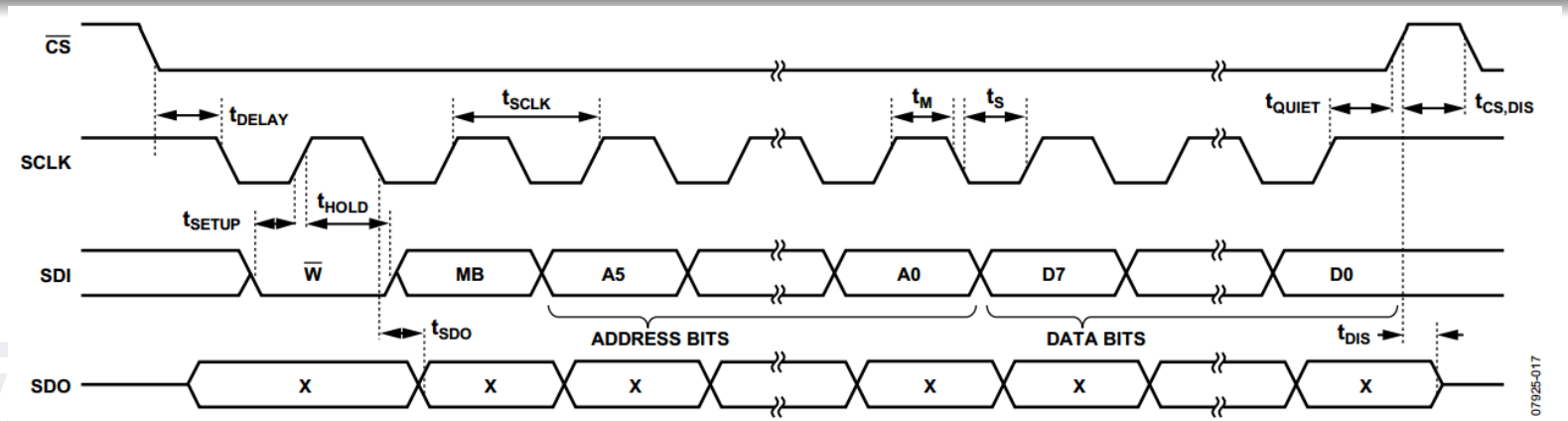

Figure 37. SPI 4-Wire Write

Writing

Accelerometer Write

1. First, a write bit and an address is necessary
2. Then we send data
3. We will receive data in the process, but it's meaningless

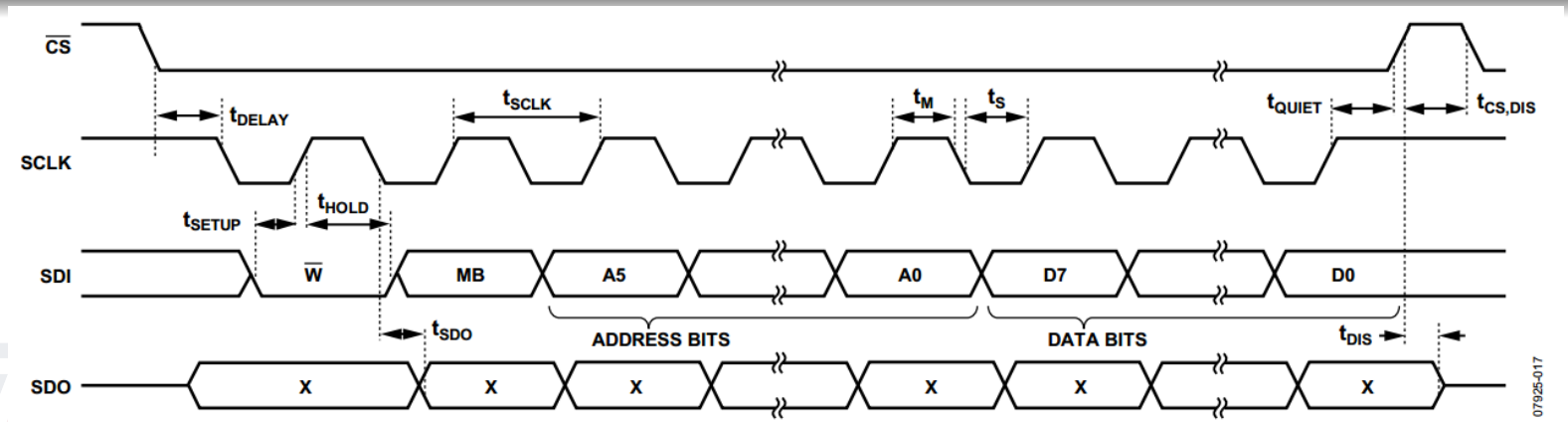

Figure 37. SPI 4-Wire Write

Writing

Accelerometer Write

1. First, a write bit and an address is necessary
2. Then we send data
3. We will receive data in the process, but it's meaningless
4. MB means "multiple-bytes"

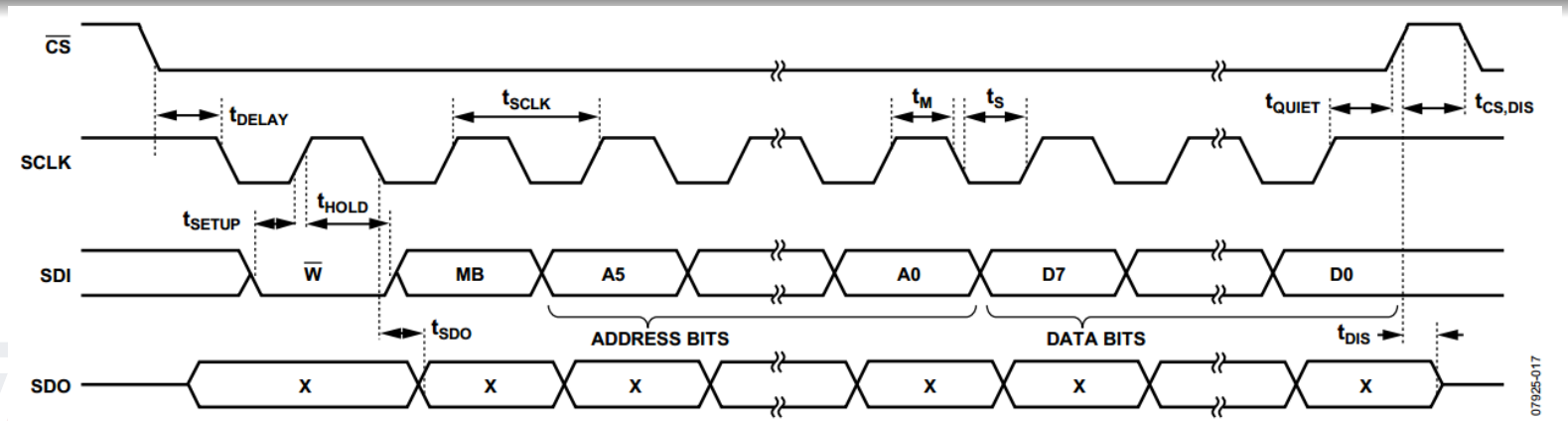

Figure 37. SPI 4-Wire Write

Reading

Accelerometer Read

1. First, a read bit and an address is necessary

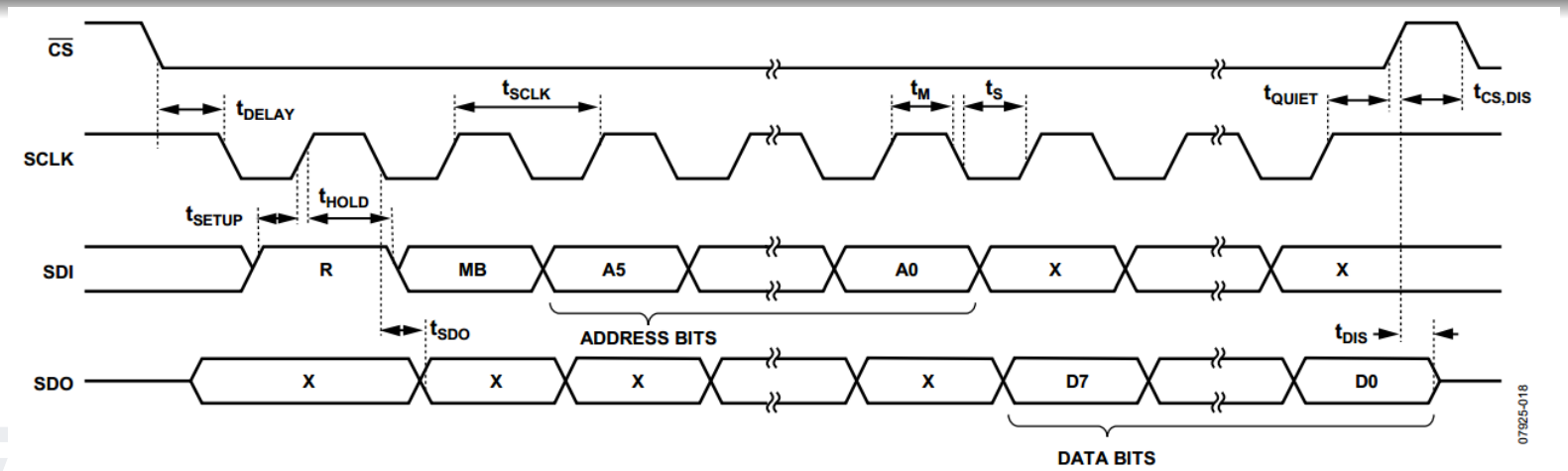

Figure 38. SPI 4-Wire Read

Reading

Accelerometer Read

1. First, a read bit and an address is necessary
2. Second, we send extra bits to receive what we want.

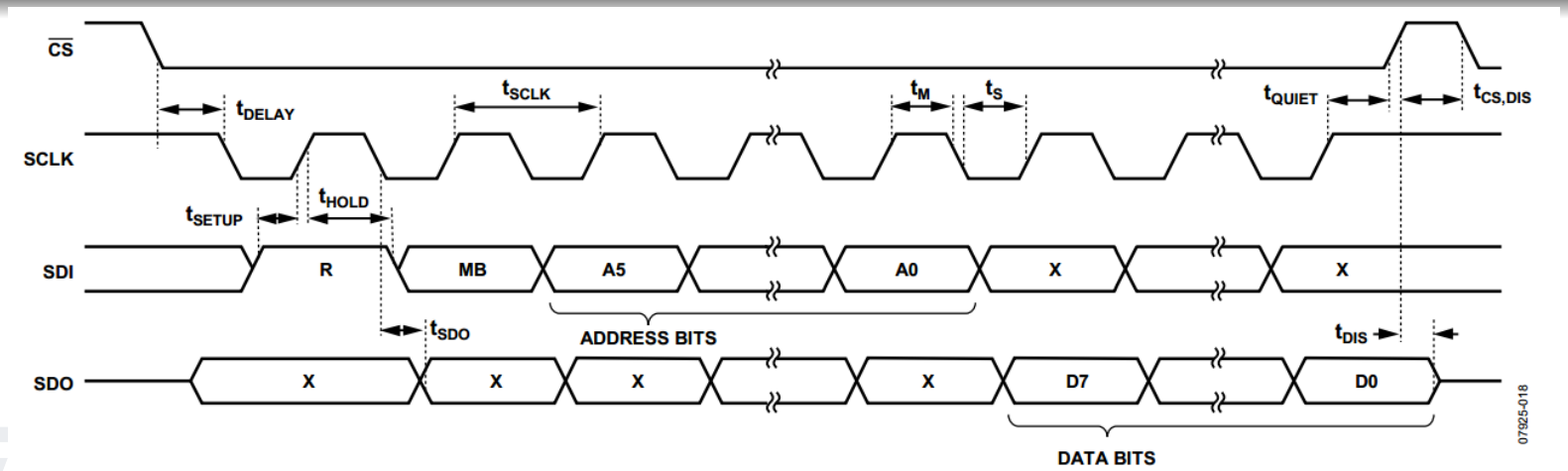

Figure 38. SPI 4-Wire Read

Reading

Accelerometer Read

1. First, a read bit and an address is necessary
2. Second, we send extra bits to receive what we want.
3. It's preferable to use 16-bit mode actually.

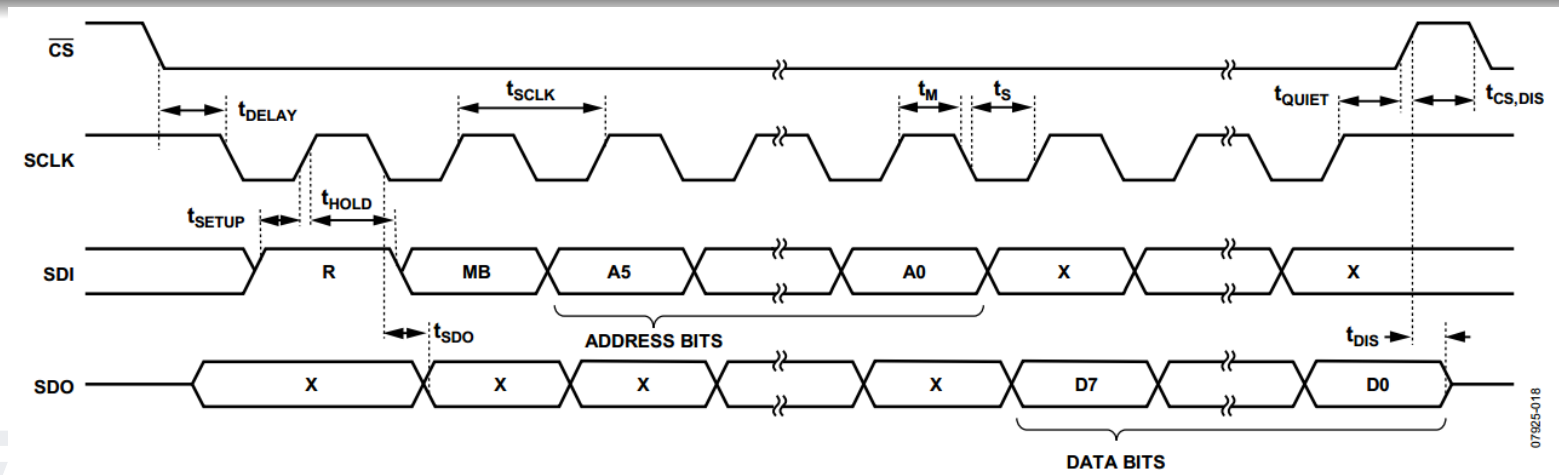

Figure 38. SPI 4-Wire Read