Serial Peripheral Interface

Outline

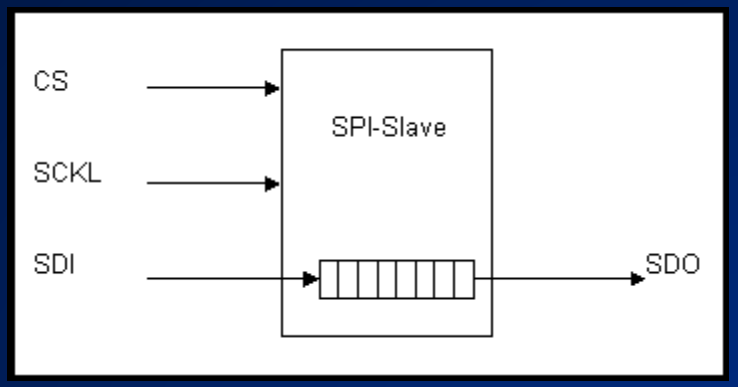
- What is SPI?
- SPI Configuration
- SPI Operation
- Master Slave Setup
- SPI Transactions
- SPI Peripheral Types
- SPI and Microcontrollers
- ESBUS

SPI
(Serial Peripheral Interface)

- Developed by Motorola
- Also known as MicroWire (National Semiconductor), QSPI (Queued),MicrowirePlus
- Synchronous Serial Communication

SPI Configuration

- Primarily used for serial communication between a host processor and peripherals.
- Can also connect 2 processors via SPI
- SPI works in a master slave configuration with the master being the host microcontroller for example and the slave being the peripheral



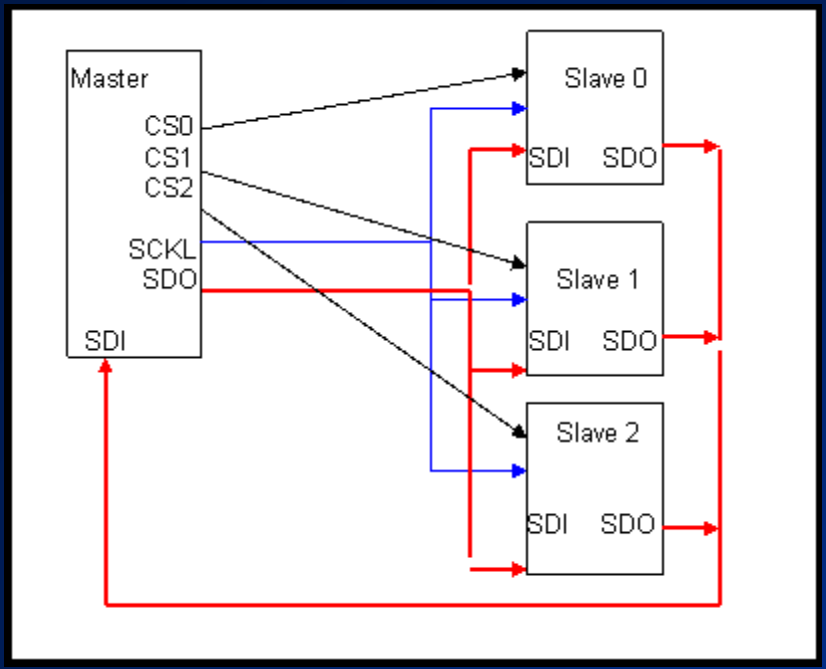
SPI Operation

- For SPI, there are Serial Clocks (SCLK), Chip Select lines (CS), Serial Data In (SDI) and Serial Data Out(SDO)
- There is only one master, there number of slaves depends on the number of chip select lines of the master.
- Synchronous operation, latch on rising or falling edge of clock, SDI on rising edge, SDO on falling edge
- Operates in 1 to 2 MHz range
- Master sends out clocks and chip selects. Activates the slaves it wants to communicate with

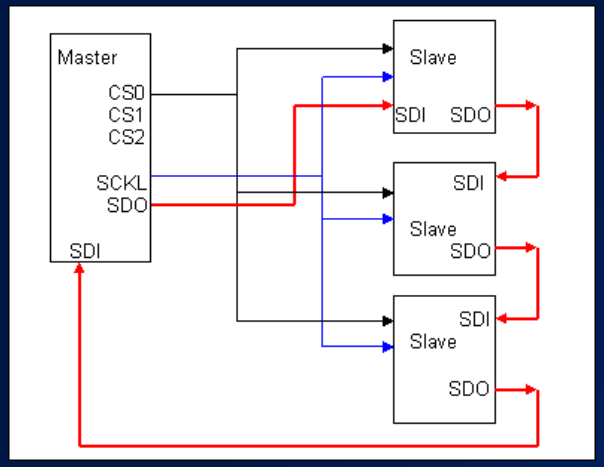
Master Slave Setup

- In this setup, there are 3 slave devices. The SDO lines are tied together to the SDI line of the master.
- The master determines which chip it is talking to by the CS lines. For the slaves that are not being talked to, the data output goes to a Hi Z state

- Multiple Independent Slave Configuration

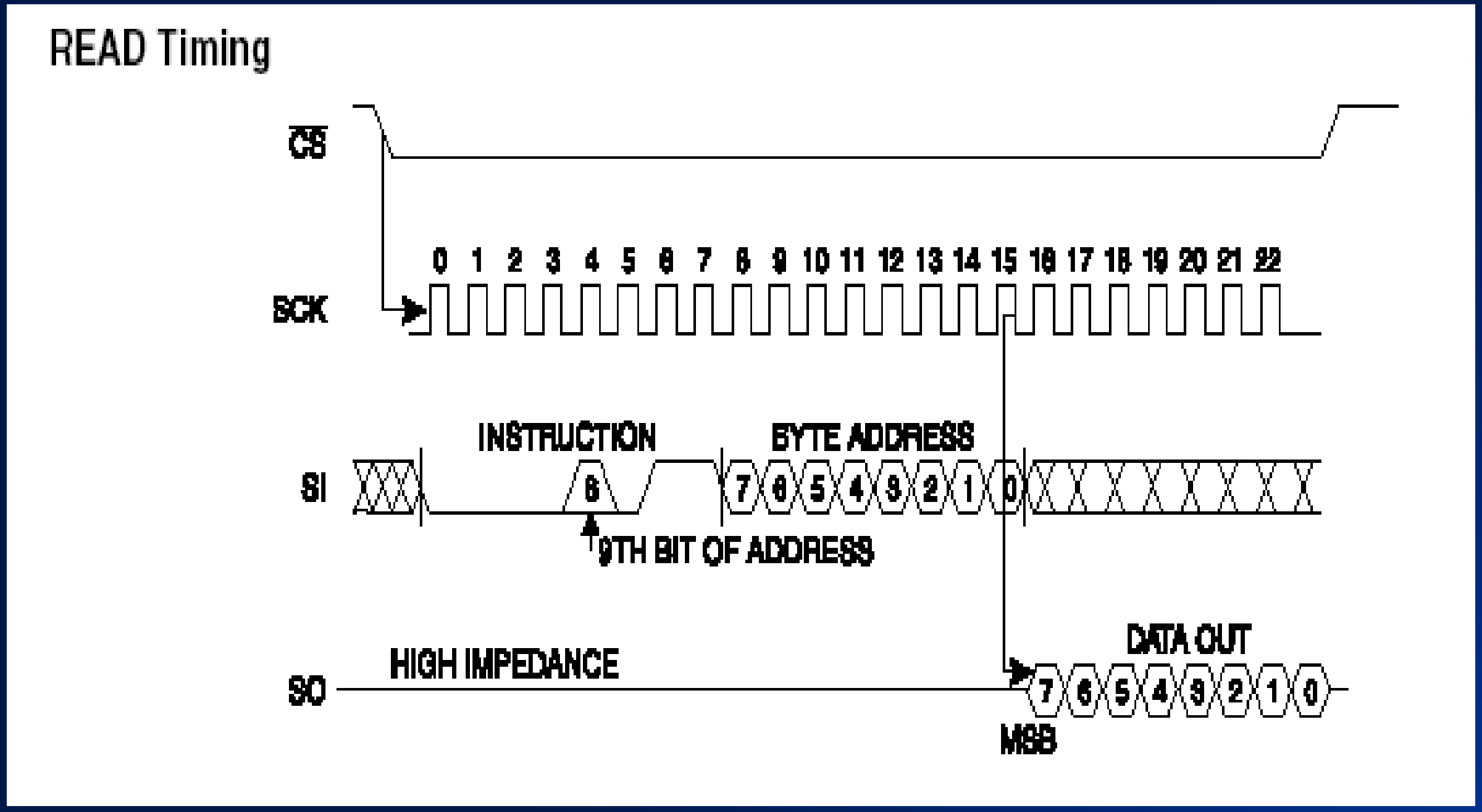


Daisy Chain
Multiple slave cascaded



- In this example, each slave is cascaded so that the output of one slave is the input of another. When cascading, they are treated as one slave and connecting to the same chip select

SPI Timing Diagram
EEPROM Read



SPI Peripheral Types

- Converters (ADC, DAC)
- Memories (EEPROM, RAM's,Flash)
- Sensors (Temperature, Humidity, Pressure)
- Real Time Clocks
- Misc- Potentiometers, LCD controllers, UART's, USB controller, CAN controller,amplifiers

Peripherals

- Vendors that make these peripherals :
- Atmel –EEPROM, Dig. POT’s
- Infineon- Pressure Sensors, Humidity Sensors
- Maxim- ADC, DAC, UART,
- TI- DSP’s, ADC, DAC
- National Semiconductor- Temperature Sensors, LCD/USB controllers

SPI and Microcontrollers

- Motorola 68HC12 Has SPI built in hardware. Easy to integrate.
- Intel 8051 Depending on Models, Most Cygnal products have I^2C and some have SPI also built in hardware for easy integration.