

# **Adding Peripherals Using SPI**

by:

Joseph Ronald Cañedo

# Serial Peripheral Interface (SPI)

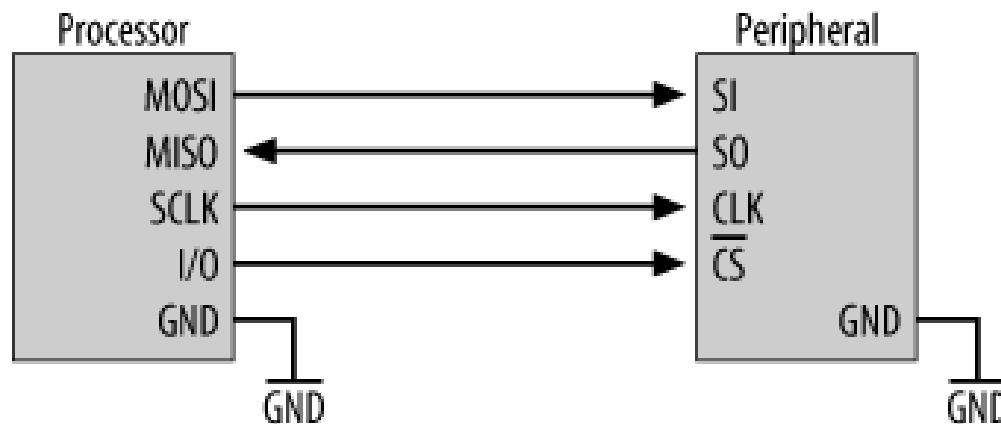
- was developed by Motorola to provide a low-cost and simple interface between microcontrollers and peripheral chips. (SPI is sometimes also known as a four-wire interface.)
- It can be used to interface to memory (for data storage), analog-digital converters, digital-analog converters, real-time clock calendars, LCD drivers, sensors, audio chips, and even other processors.
- The range of components that support SPI is large and growing all the time.

# Serial Peripheral Interface (SPI)

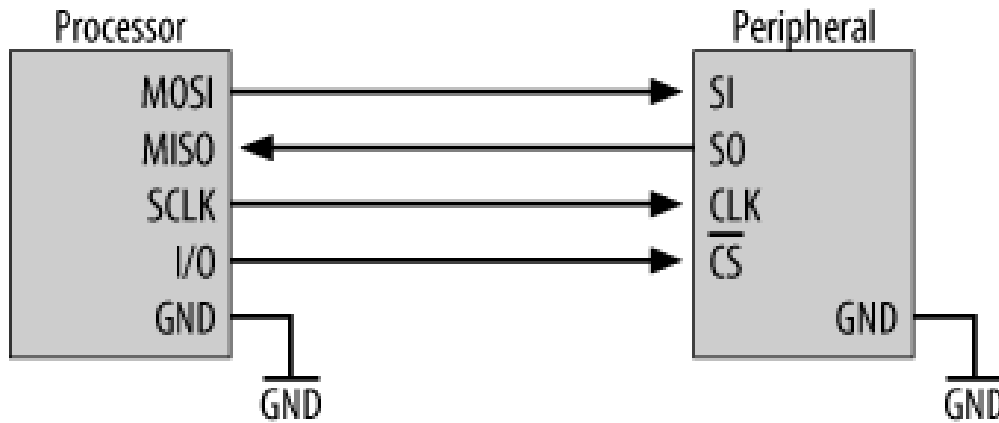
- SPI is a synchronous protocol in which all transmissions are referenced to a common clock, generated by the master (processor).
- The receiving peripheral (slave) uses the clock to synchronize its acquisition of the serial bit stream.
- Many chips may be connected to the same SPI interface of a master.
- A master selects a slave to receive by asserting the slave's chip select input.
- A peripheral that is not selected will not take part in a SPI transfer.

# Serial Peripheral Interface (SPI)

- SPI uses four main signals: Master Out Slave In (MOSI), Master In Slave Out (MISO), Serial Clock (SCLK or SCK) and Chip Select ( $\overline{CS}$ ) for the peripheral. Some processors have a dedicated chip select for SPI interfacing called Slave Select ( $\overline{SS}$ ).

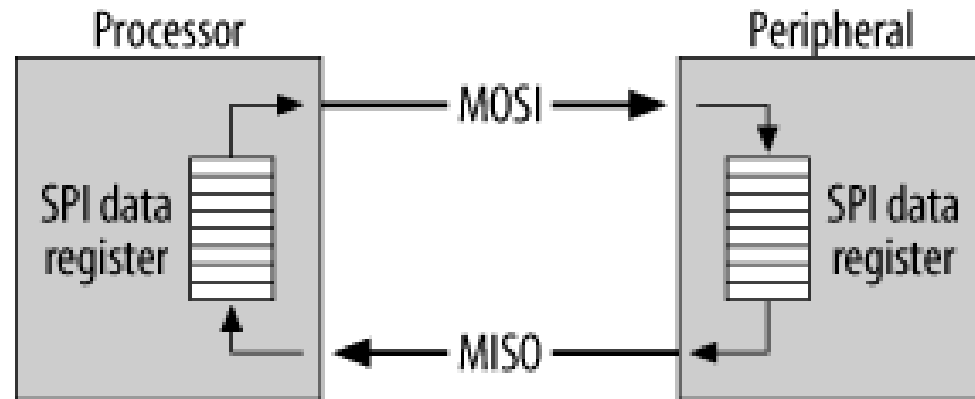


# Serial Peripheral Interface (SPI)



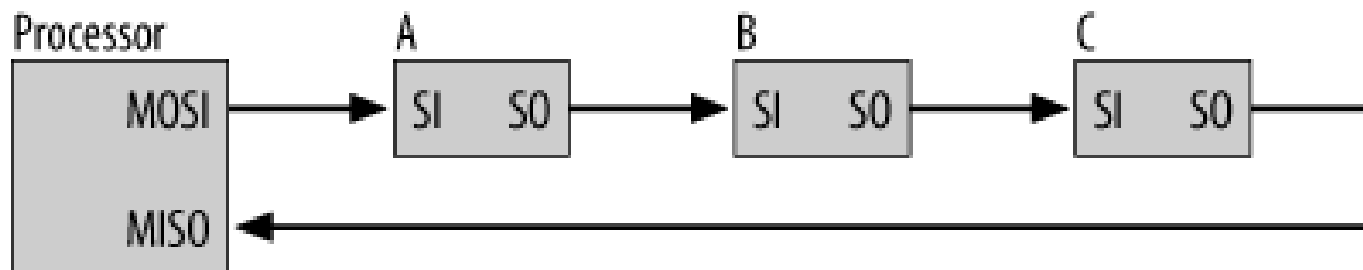
Basic SPI

SPI Transmission



# Serial Peripheral Interface (SPI)

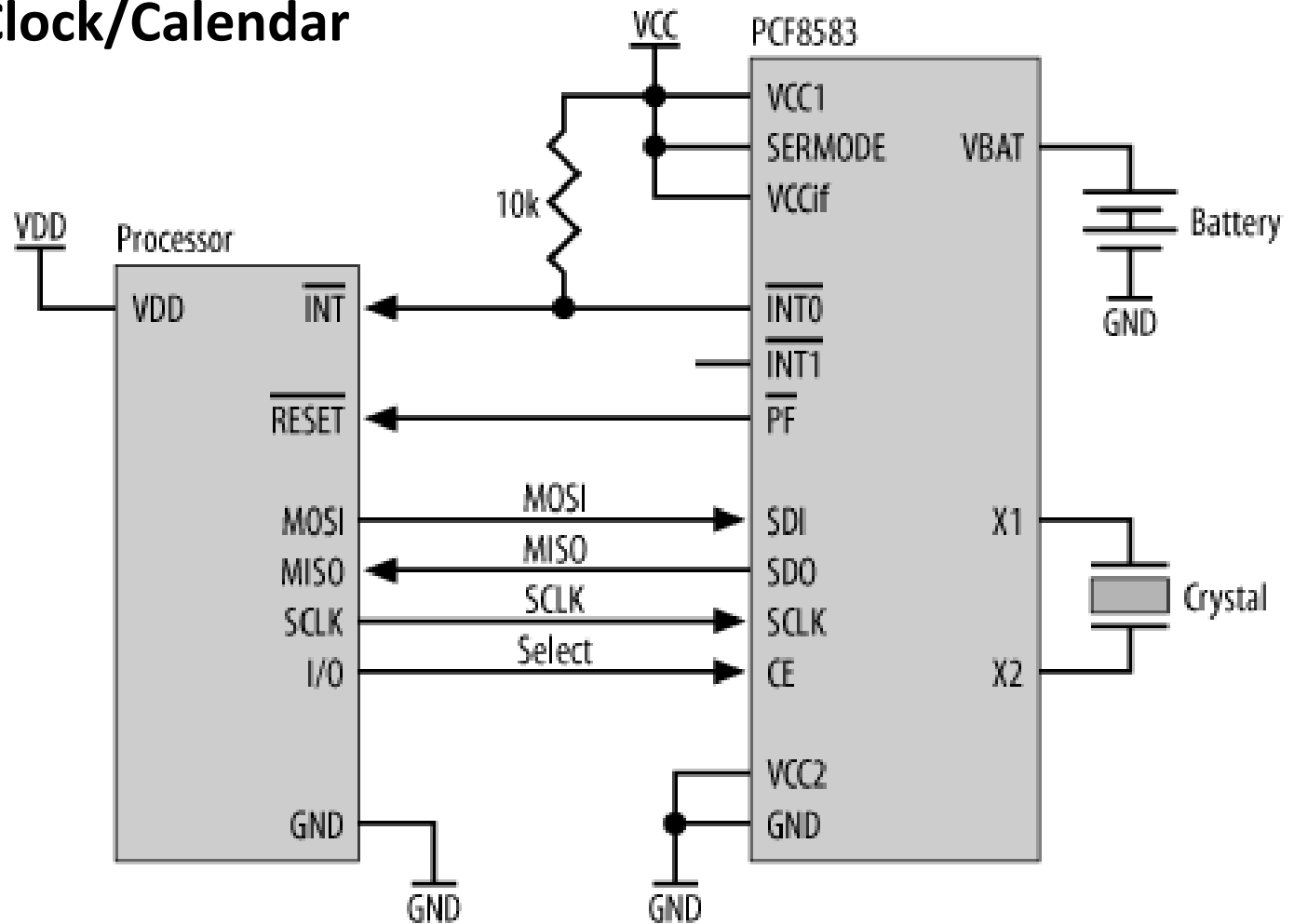
- Some peripherals can handle multiple byte transfers, where a continuous stream of data is shifted from the master. Many memory chips with SPI interfaces work this way. With this type of transfer, the chip select for the SPI slave must remain low for the entire duration of the transmission.



**Daisy-chaining three SPI devices**

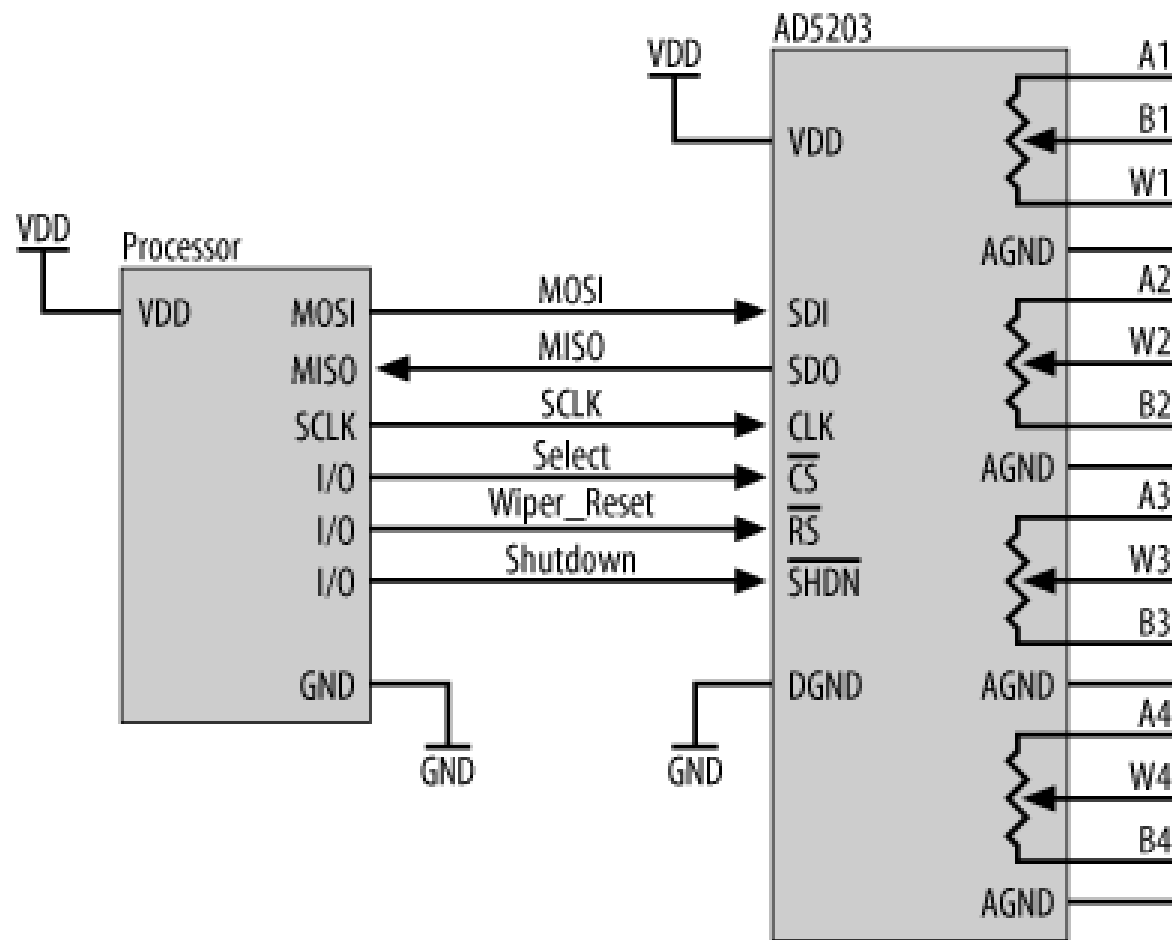
# Applications

## SPI-Based Clock/Calendar



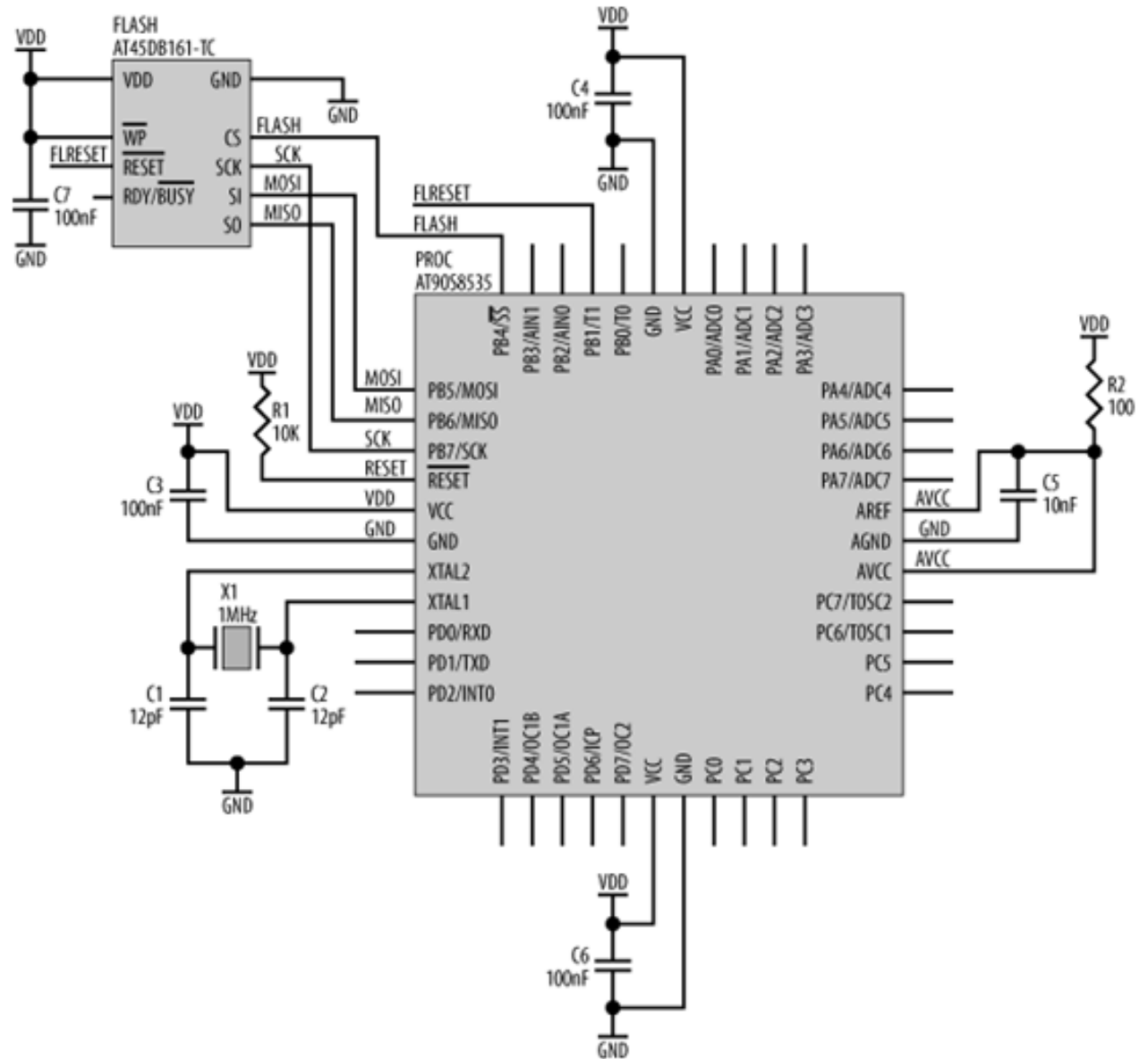
# Applications

## SPI-Based Digital Potentiometer



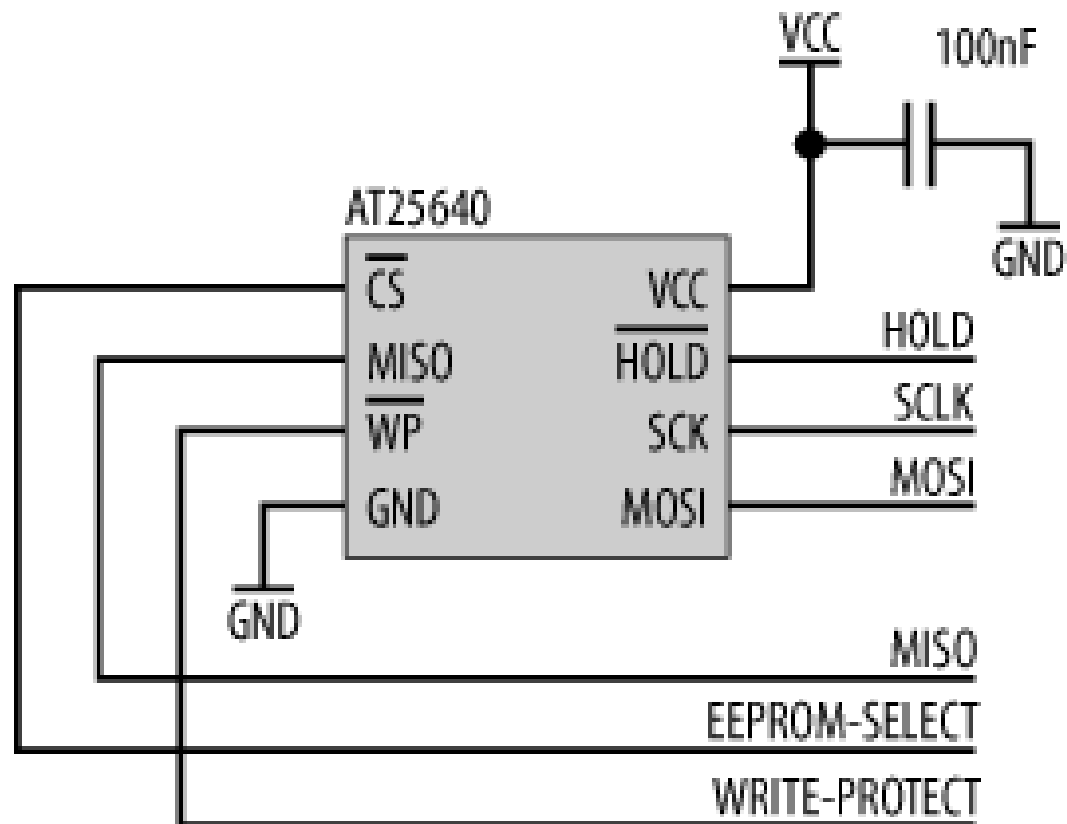
# Applications

Nonvolatile  
Data  
Memory  
with SPI



# Applications

Parameter  
Memory  
Using SPI



Using an AT25640 EEPROM

