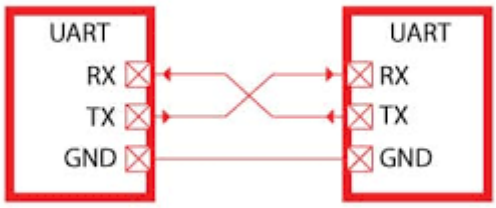
UART(Universal Asynchronous Receiver Transmitter):

- UART is simple Half-duplex asynchronous serial protocol.
- Simple communication between two equivalent nodes.
- Any node can initiate communication.
- Since Half-duplex, two lanes of communication are completely independent.

Connections for UART:

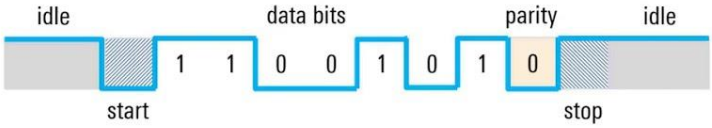


- Speed of communication is measured in baud rate and pre-determined on both sides.
- A general rule of thumb is to use 9600 bauds for wired communication.
- UART implements error detection in form of parity bit.
- Rxd, Txd pins in the Microcontroller are used to connect to the UART.

Format of Communication:

UART frame format

- UART frames consist of:
  - Start / stop bits
  - Data bits
  - Parity bit (optional)
- High voltage (“mark”) = 1, low voltage (“space”) = 0

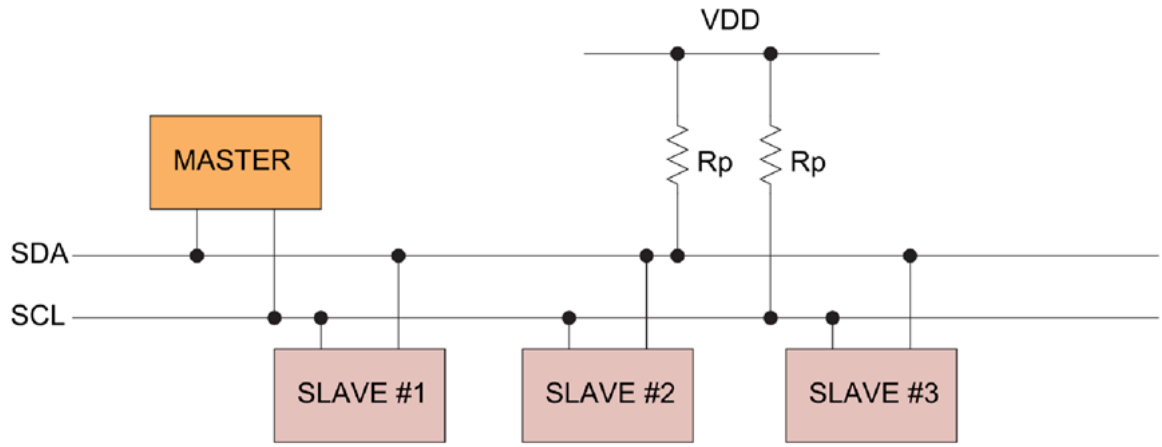


I2C(Inter- Integrated Circuit):

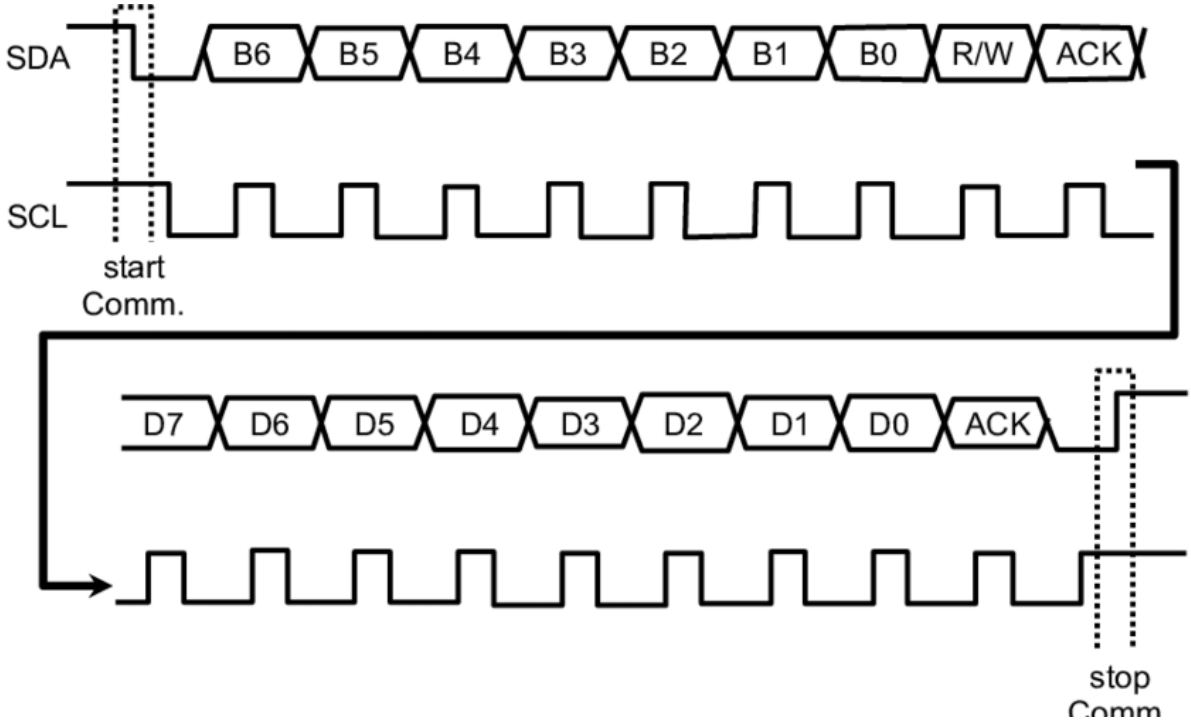
- It is a 2-wire serial protocol with addressing capability.
- Multi-master and Multi-slave Architecture.
- Speeds upto 3.4 Mbps
- Uses bus Arbitration
- I2C consists of Open collector bus driver and Pull-up Resistors.
- Transmitter/Receiver differs from Master/Slave
  - Master Initiates Transaction
  - Slave Respond
- Transmitter sets data on SDA line
  - For Read Slave is Transmitter
  - For write Master is Transmitter

I2C Wiring:

- I2C has 2 lines
  SDA -Serial Data
  SCL- Serial Clock



I2C Data Transmission:



- Transmission of data is 8-bits
  - Write- Master Transmits, Slave Acknowledge

- Read- Slave Transmits, Master Acknowledge

➢ Transmission continues until master create stop condition.

Serial Peripheral Interface(SPI):

➢ SPI is a 4-wire serial bus.

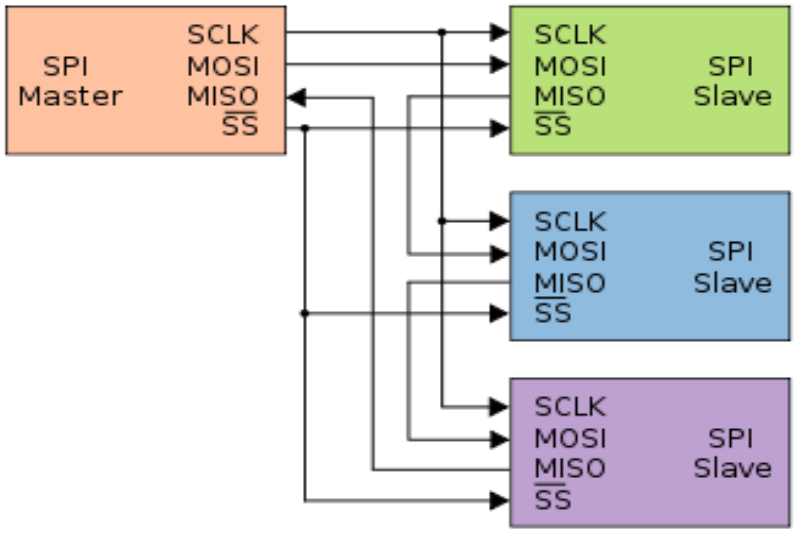
➢ SPI supports Full-Duplex

➢ SPI supports 1 Master and multiple Slaves

➢ Used for short distance communication

➢ Communication is synchronized using clock signals

SPI Bus Wiring:



MOSI- Master Out Serial In

-Carries data from master to slave

MISO- Master In Serial out

-Carries data from slave to master

SS- Select Slave

- Unique line to select slave

SCLK-System clock produced by master to synchronize data transfer

Applications of SPI:

- Used in peripherals such as LCD,Sensors,Radios etc…
- Used in Micro-controllers to have serial communication with the peripherals.