# Inter-Integrated Circuit

Networks and Embedded Systems

Second Grade Level

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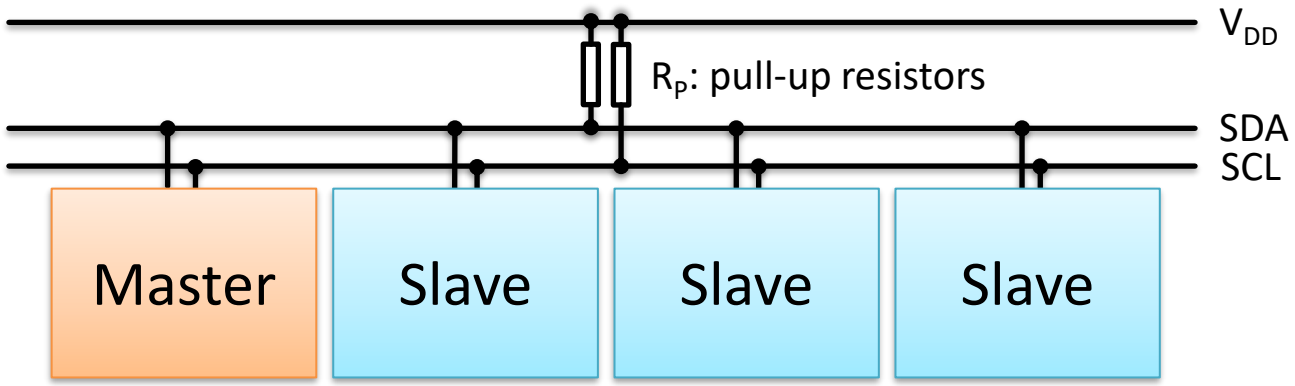
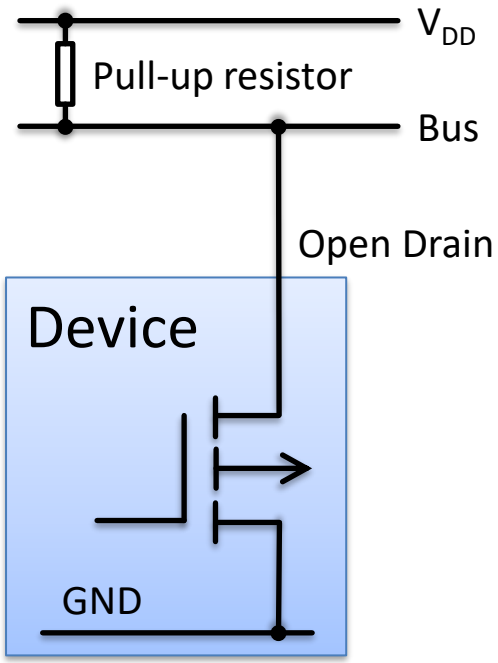
# I²C (1)

- Design
  - Two bidirectional lines
    - SDA: Serial Data Line
    - SCL: Serial Clock Line



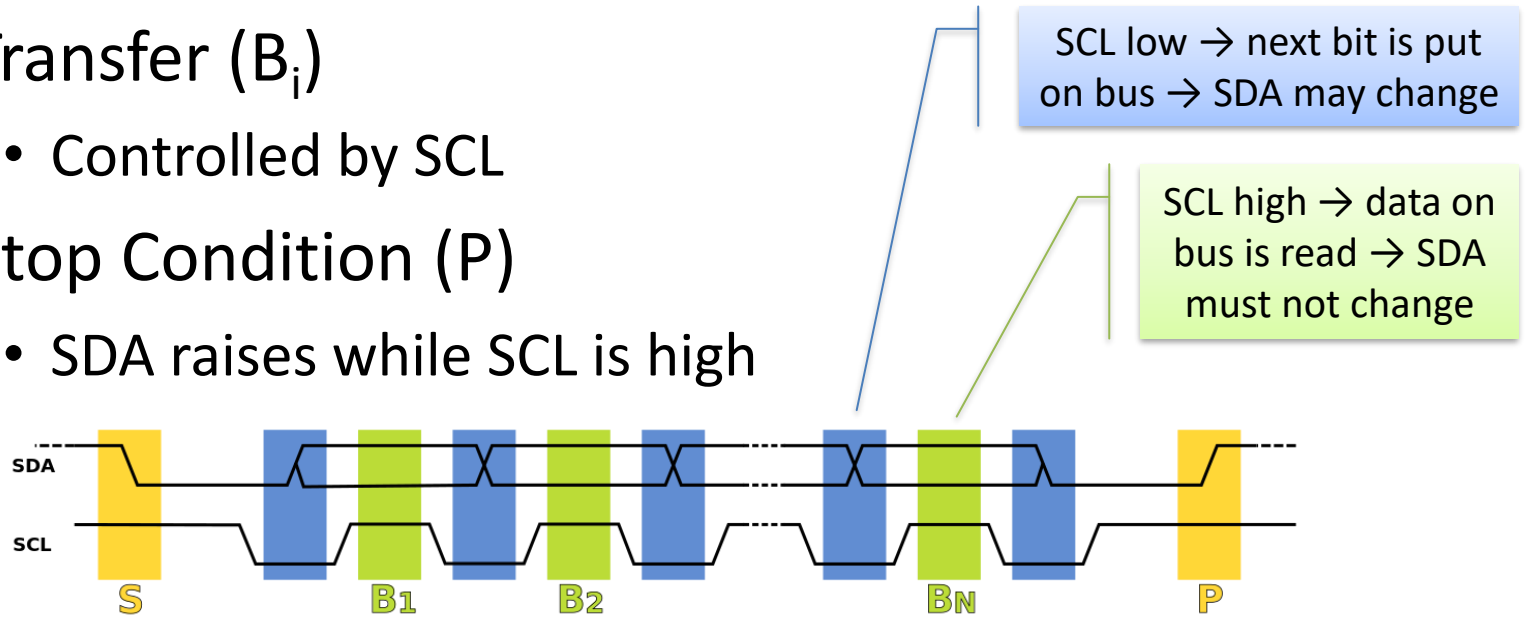
# I²C (2)

- Design (continued)
  - Open-drain lines
    - Pulled-up resistors
    - Wired-AND
      - Dominant *0*
      - Recessive *1*
    - Collision detection



# I²C (3)

- Data Transfer
  - Start Condition (S)
    - SDA falls while SCL is high
  - Transfer ($B_i$)
    - Controlled by SCL
  - Stop Condition (P)
    - SDA raises while SCL is high

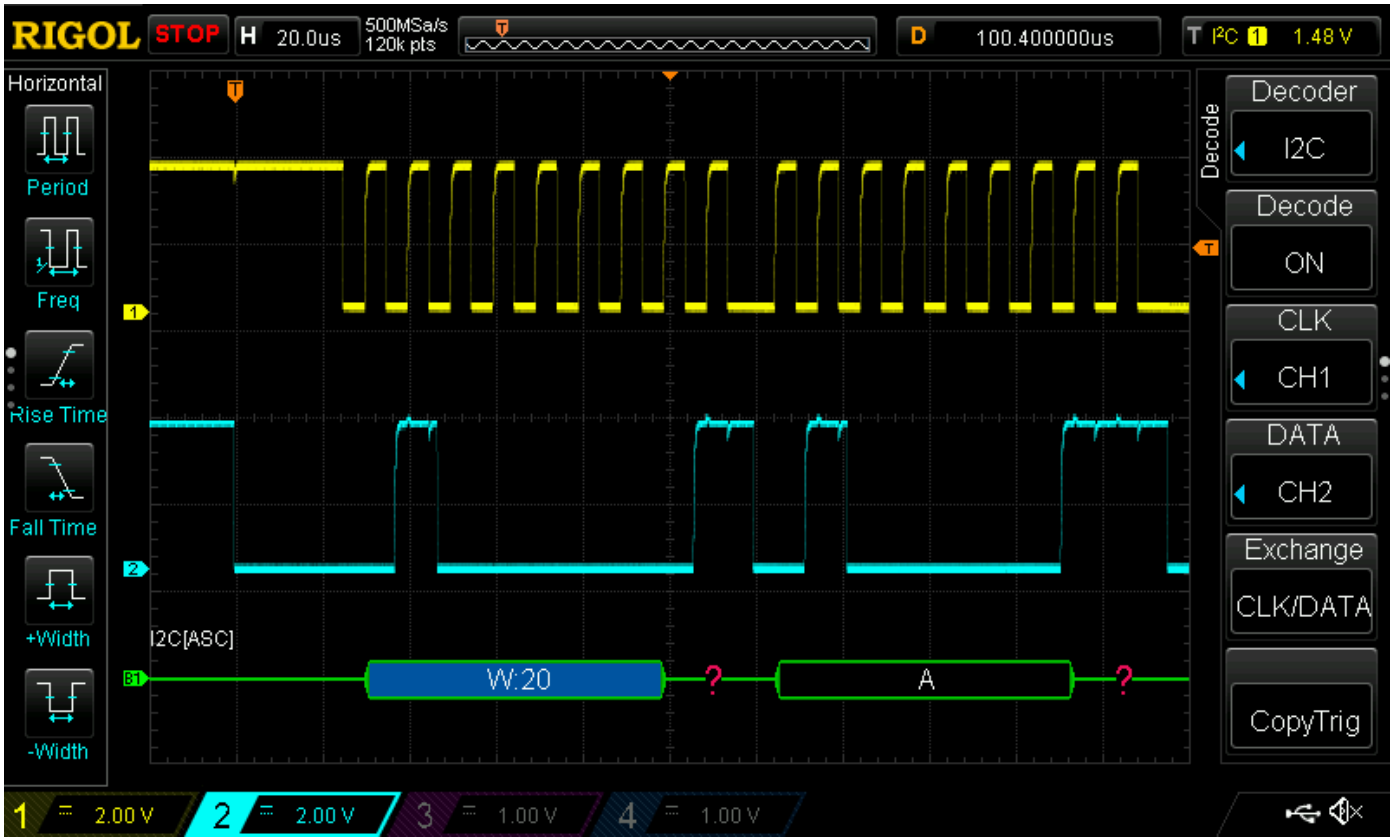


# I²C (4)

- Addressing
  - Master addresses slave
  - Address space: 7 bit (10 bit also possible)
  - First byte after start condition is address
  - Eighth bit is read/write indicator
    - 0: write, 1: read
  - Slave replies with ACK

# I²C (5)

- Real-Life Example



# I²C (6)

- Advantages
  - Just two lines necessary
  - Multiple masters possible
  - In-band addressing by protocol
  - Official I²C specifications available
  - Supports various modes of operation

# I²C (7)

- Disadvantages
  - Open-drain design increases power draw
  - Only half-duplex communication possible
  - Address conflicts
    - As slaves often restrict address space
  - No automatic bus configuration
  - Stalled slaves can produce bus faults