

ECED2200 – DIGITAL CIRCUITS

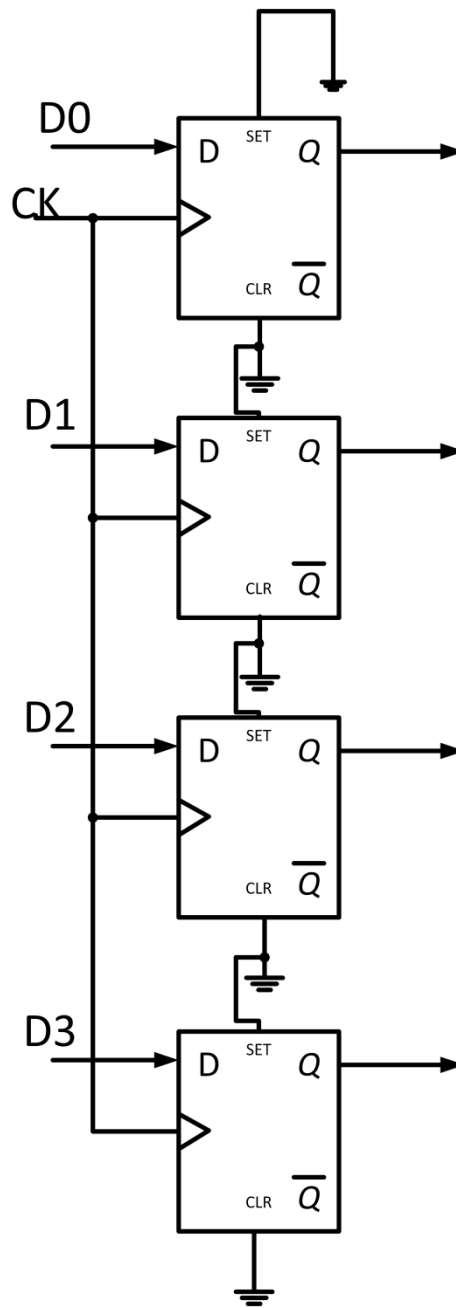
Serial Protocols, Registers, Shift
Registers

GENERAL NOTES

- See updates to these slides: www.newae.com/teaching
- These slides licensed under ‘[Creative Commons Attribution-ShareAlike 3.0 Unported License](https://creativecommons.org/licenses/by-sa/3.0/)’
- These slides are not the complete course – they are extended in-class
- You will find the following references useful, see www.newae.com/teaching for more information/links:
 - The book “Bebop to the Boolean Boogie” which is available to Dalhousie Students
 - Course notes (covers almost everything we will discuss in class)
 - Various websites such as e.g.: www.play-hookey.com
 - The book “Contemporary Logic Design”, which was used in previous iterations of the class and you may have already

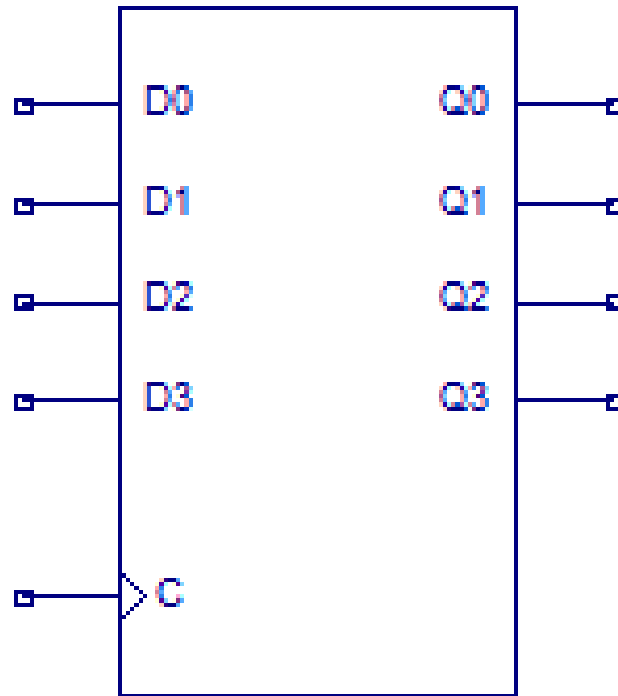
REGISTERS





REGISTERS

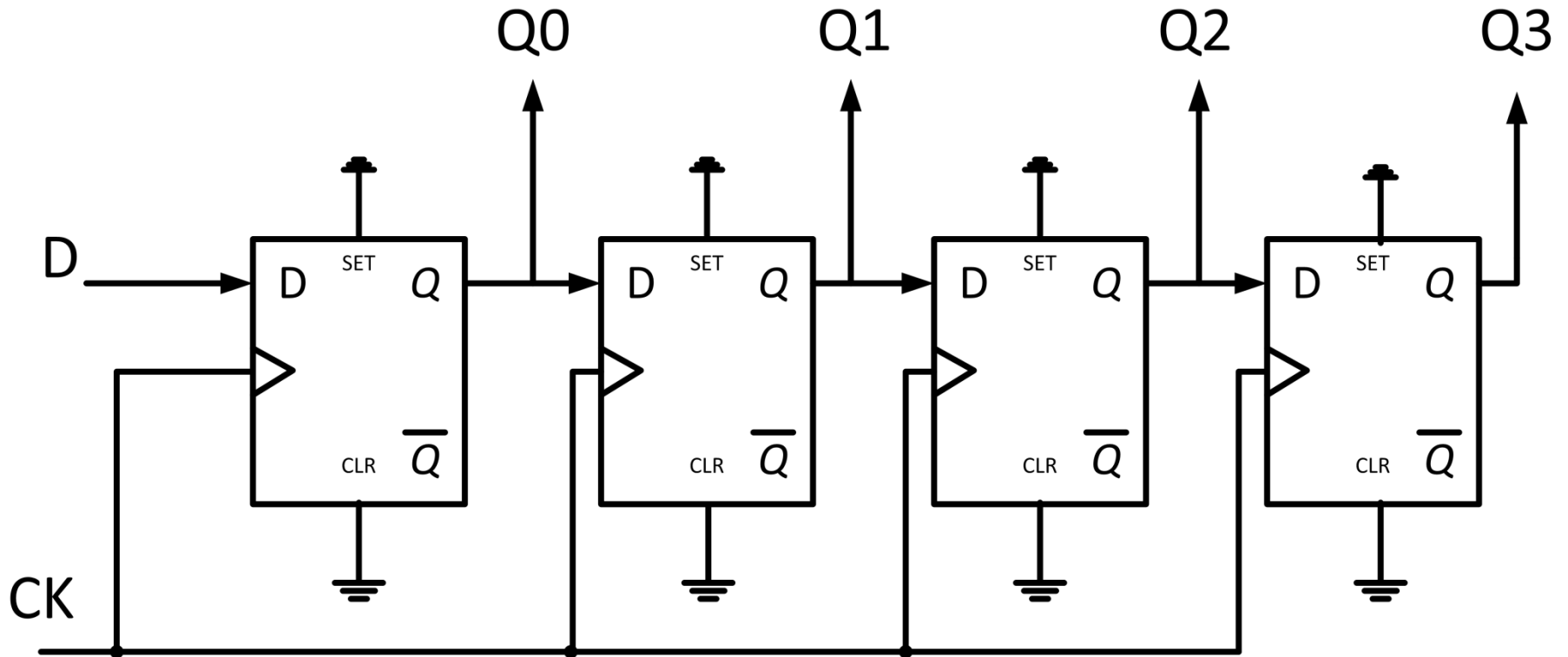
FD4



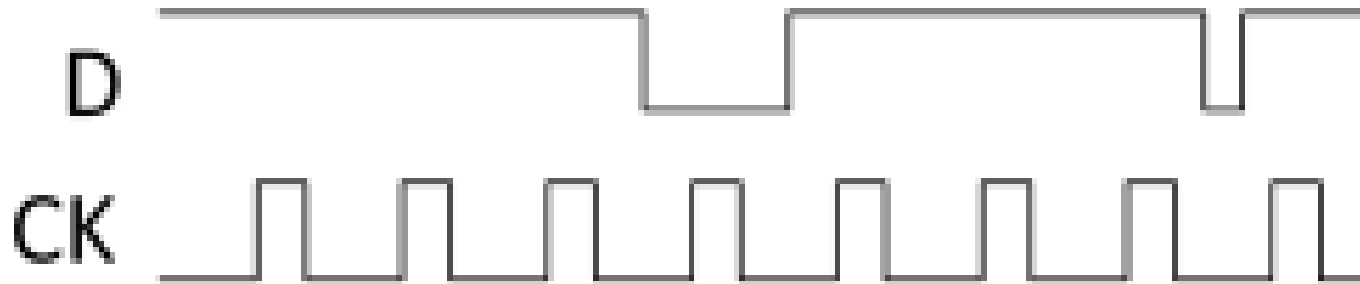
SHIFT REGISTERS



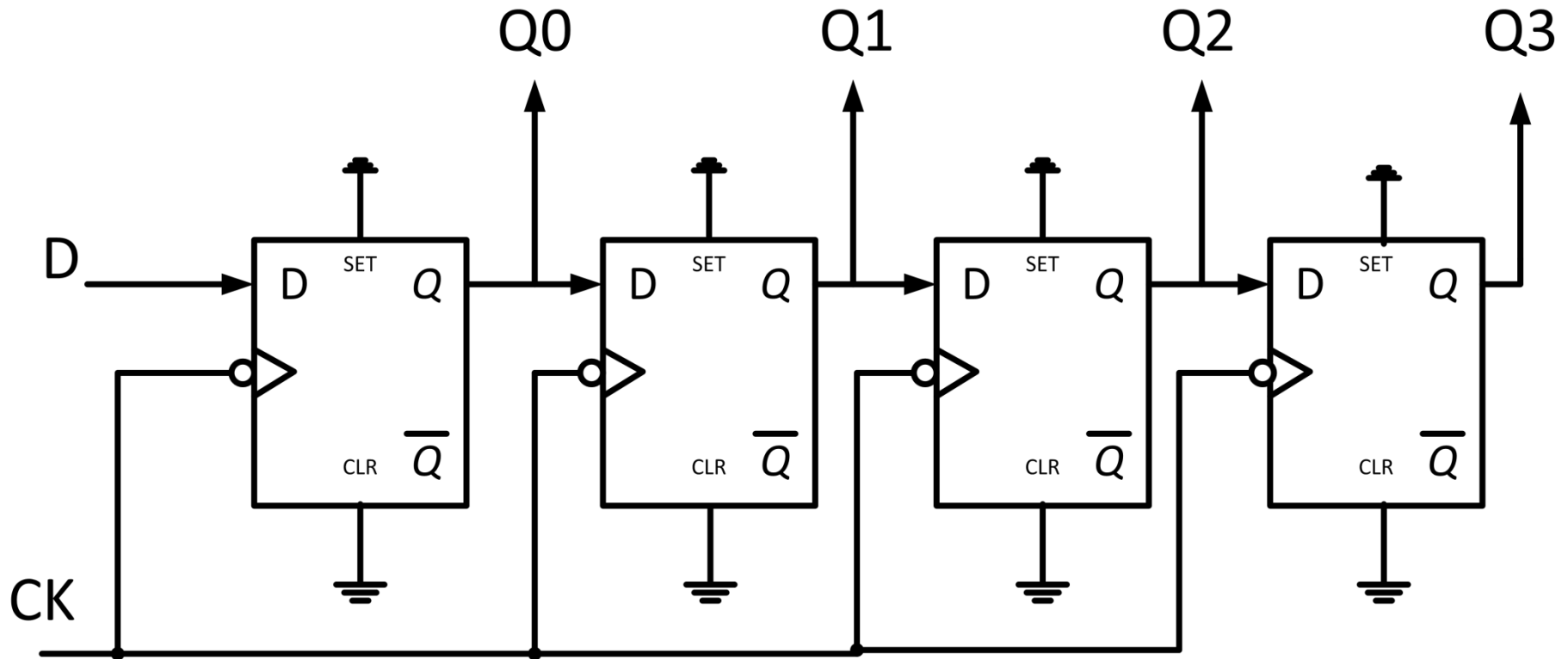
SERIAL TO PARALLEL SHIFT REGISTER



SERIAL TO PARALLEL SHIFT REGISTER

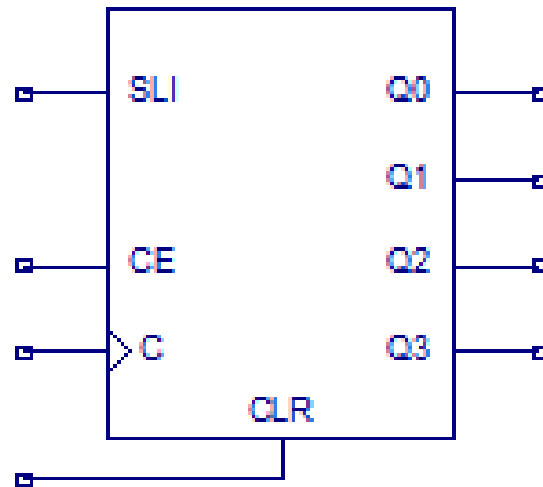


SERIAL TO PARALLEL SHIFT REGISTER



SERIAL TO PARALLEL SHIFT REGISTER

SR4CE



SERIAL PROTOCOLS



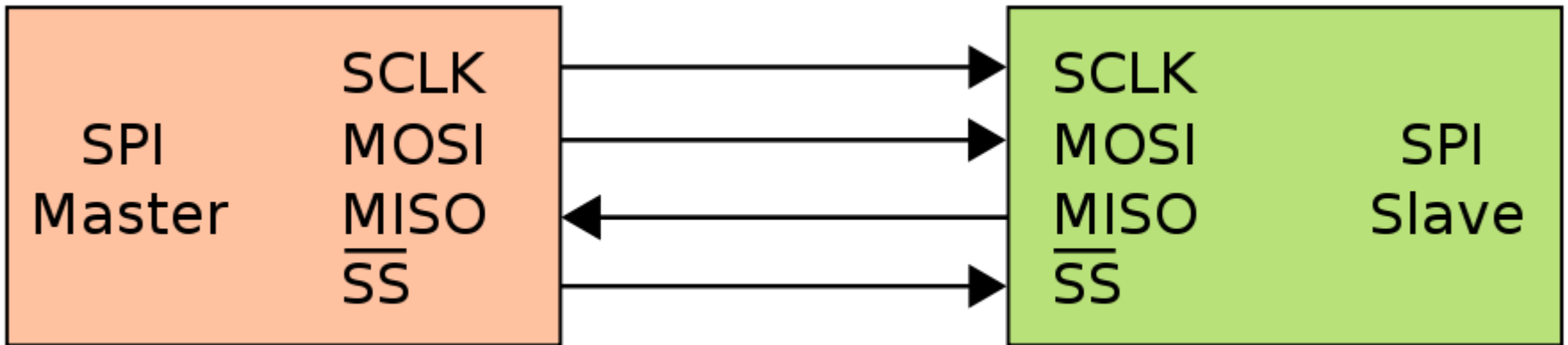
GENERAL CHARACTERISTICS OF SERIAL

- Bit Rate
- MSB/LSB First
- Length of data
- Control Lines

SERIAL PERIPHERAL INTERFACE (SPI)

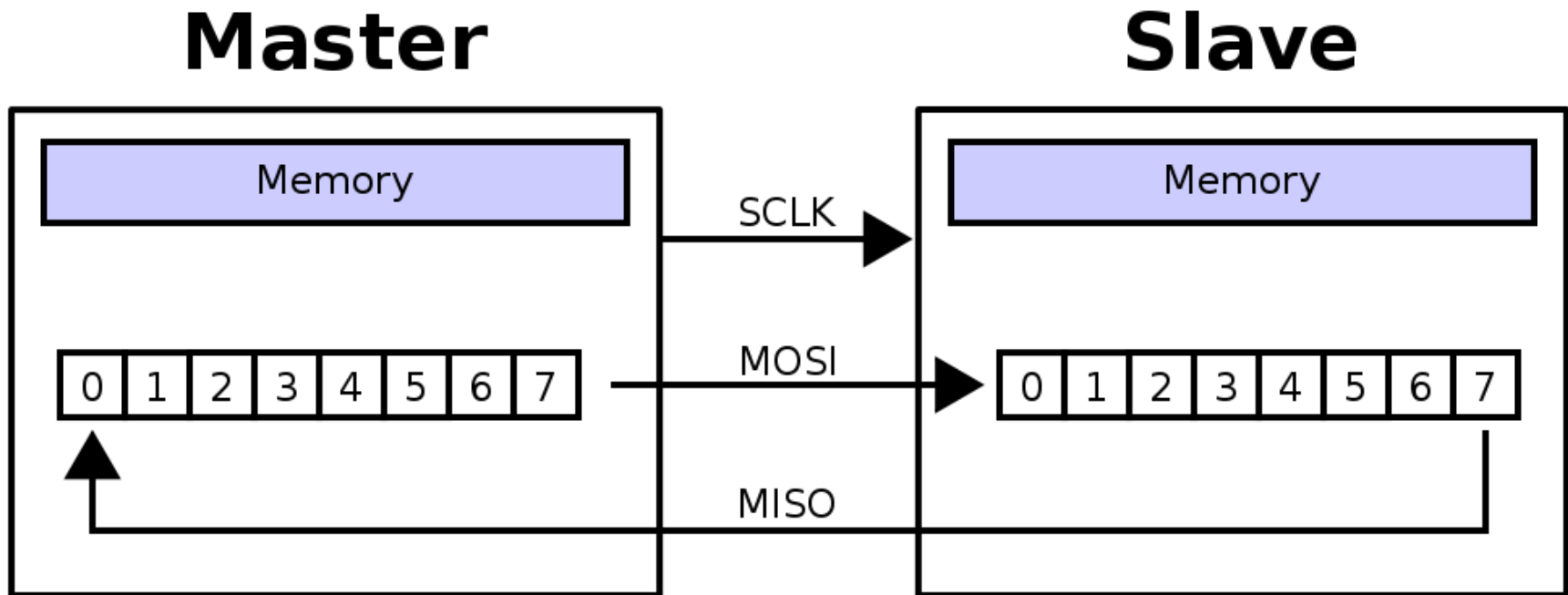
- Four lines:
 - Data In
 - Data Out
 - Clock
 - Slave Select

SPI



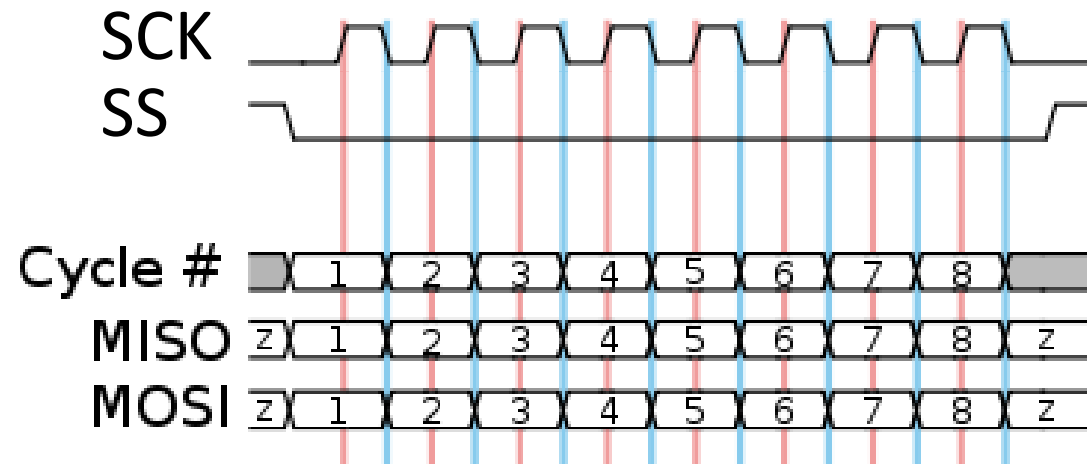
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SPI



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SPI

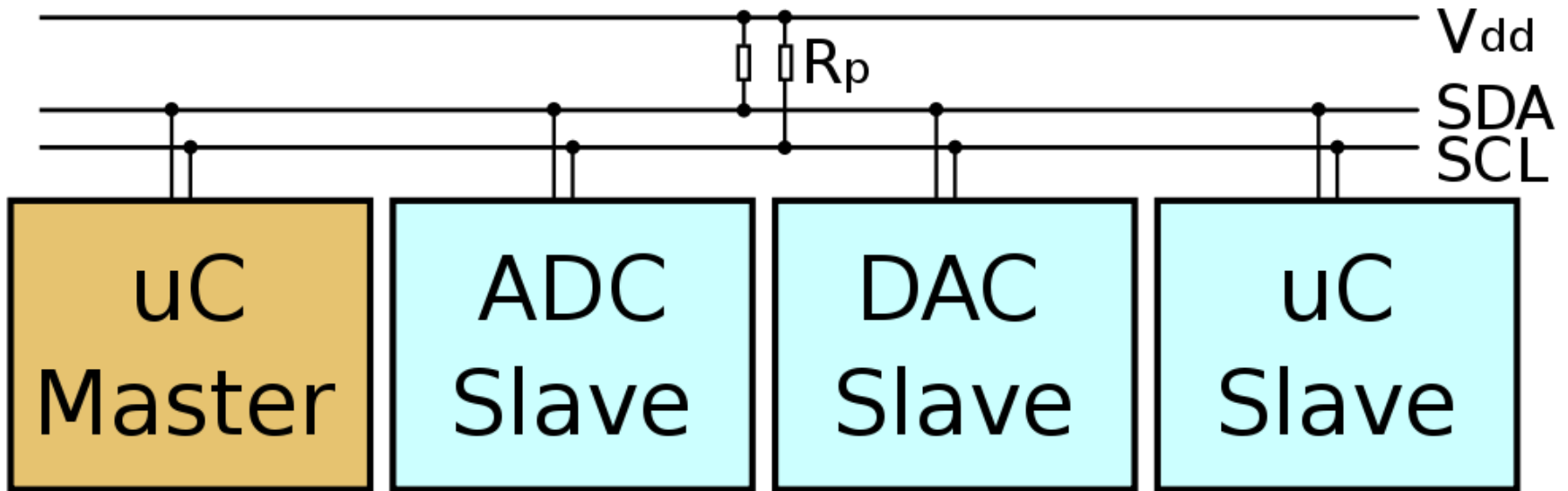


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INTER-IC (I²C)

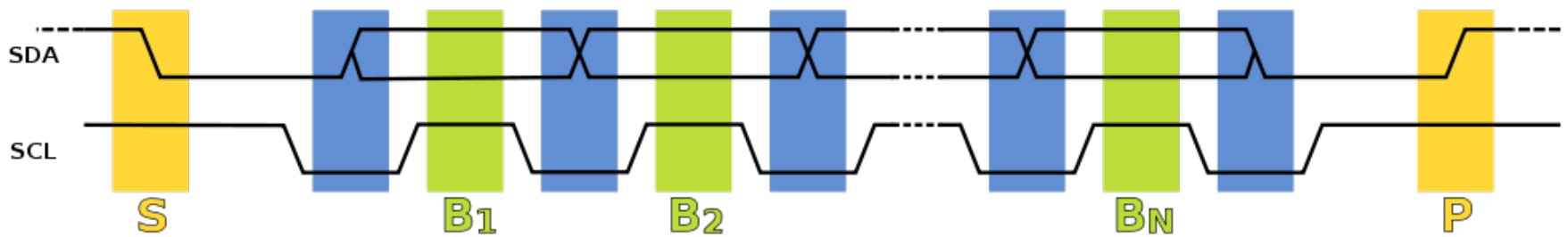
- Two lines:
 - Clock
 - Bidirectional Data

I²C



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INTER-IC (I²C)

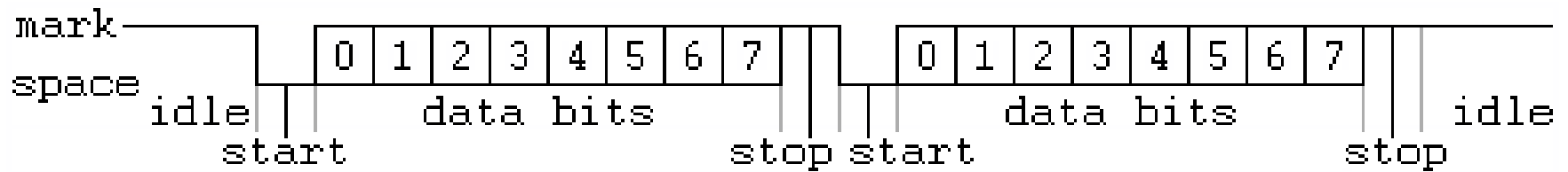


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ASYNCHRONOUS SERIAL

- Two lines typically:
 - Data In
 - Data Out

ASYNCHRONOUS SERIAL



UNIVERSAL SERIAL BUS (USB)

- Two Lines
 - D+, D- = Both Data Lines

SUMMARY

- ECED Class Notes
- Bebop to the Boolean Boogie