Introduction to Embedded System Design

Physical Interfacing- 2

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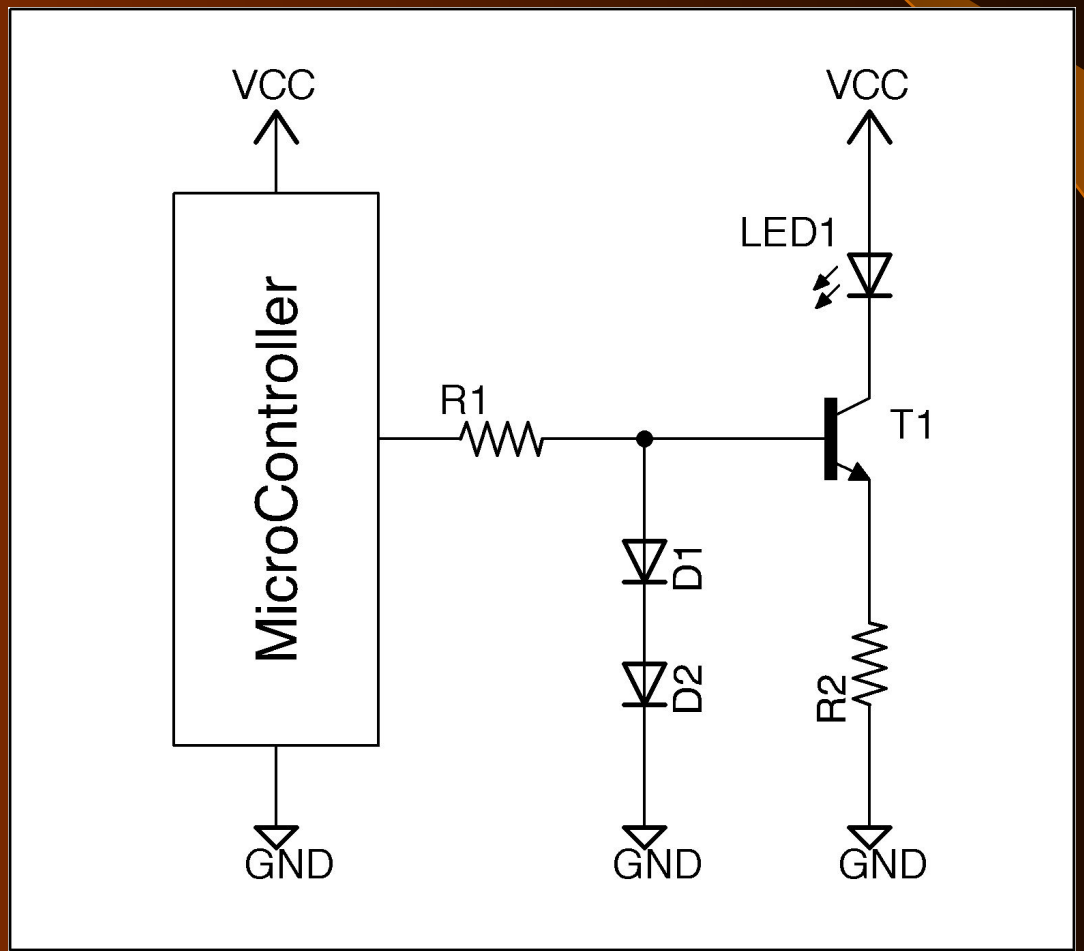
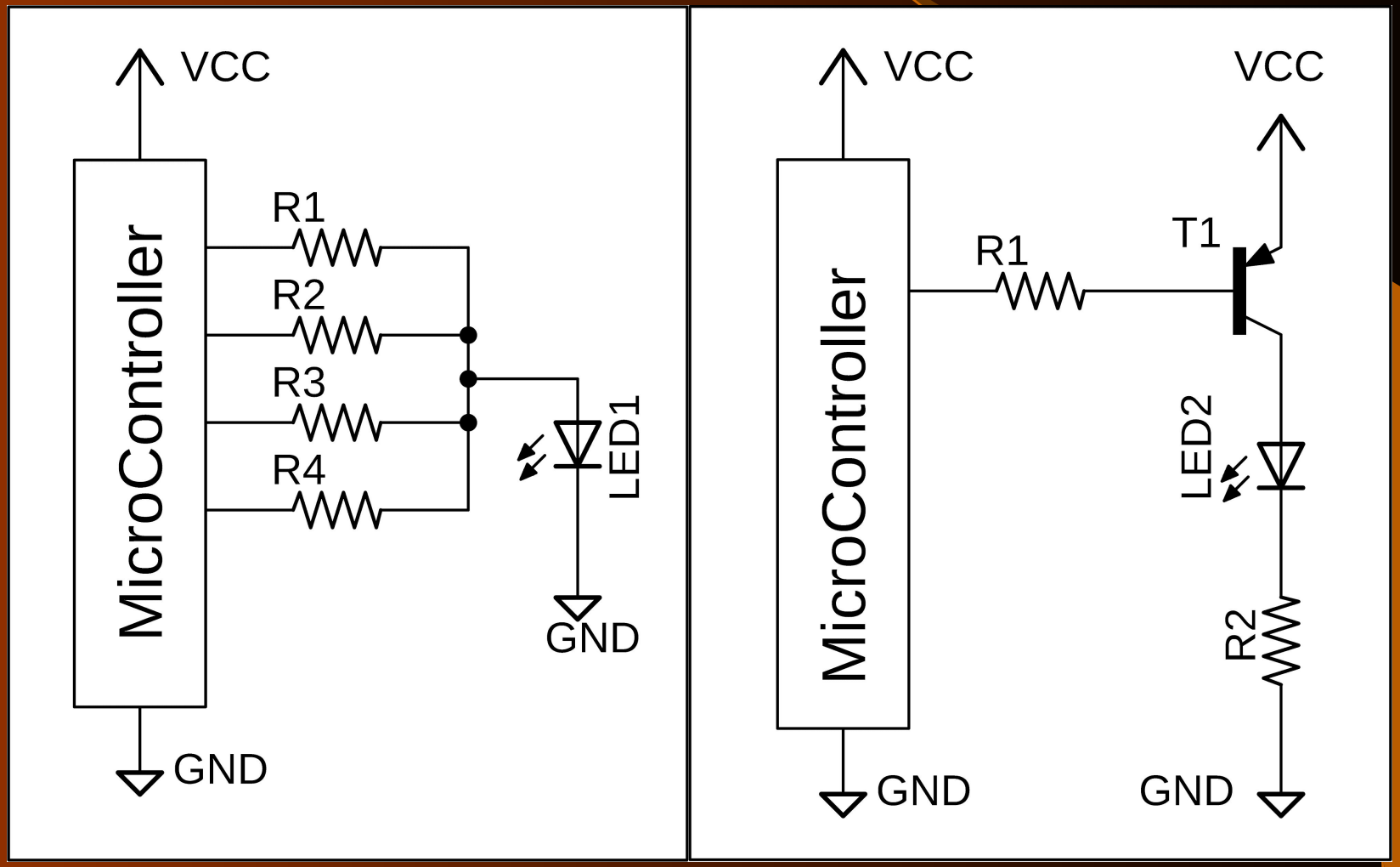
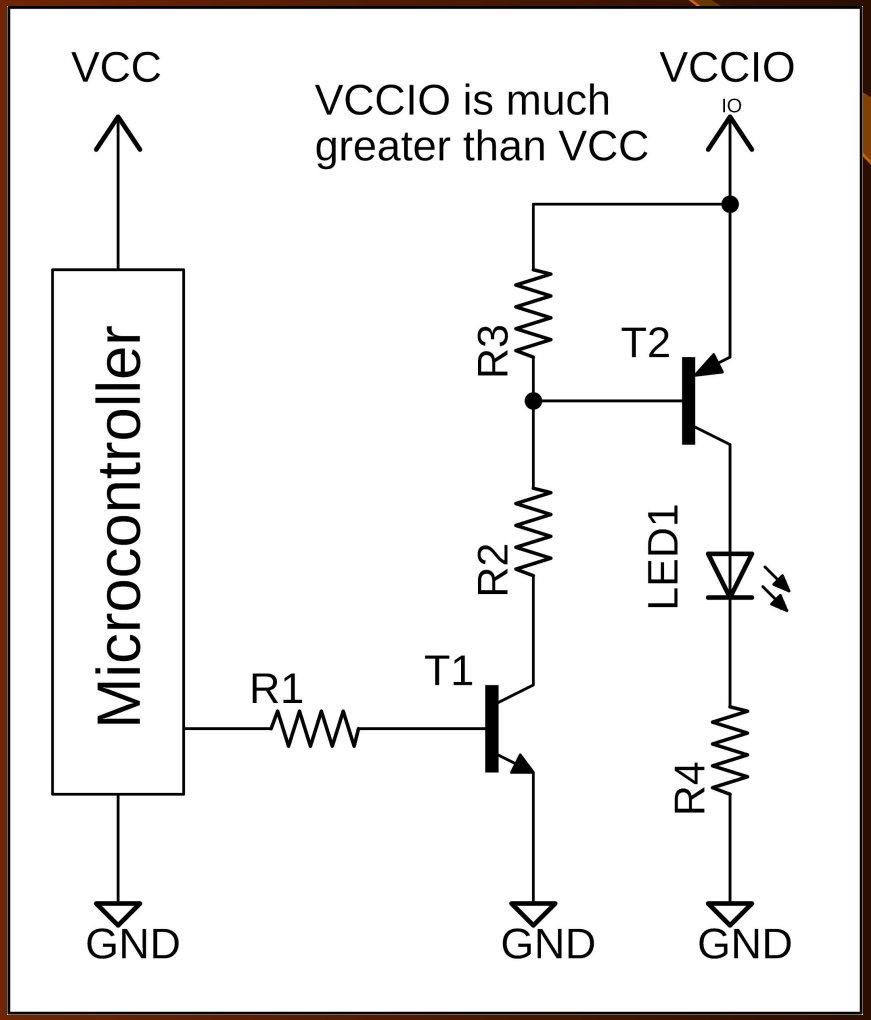
Driving LEDs (Or Other loads): Constant Current Low Side Driver



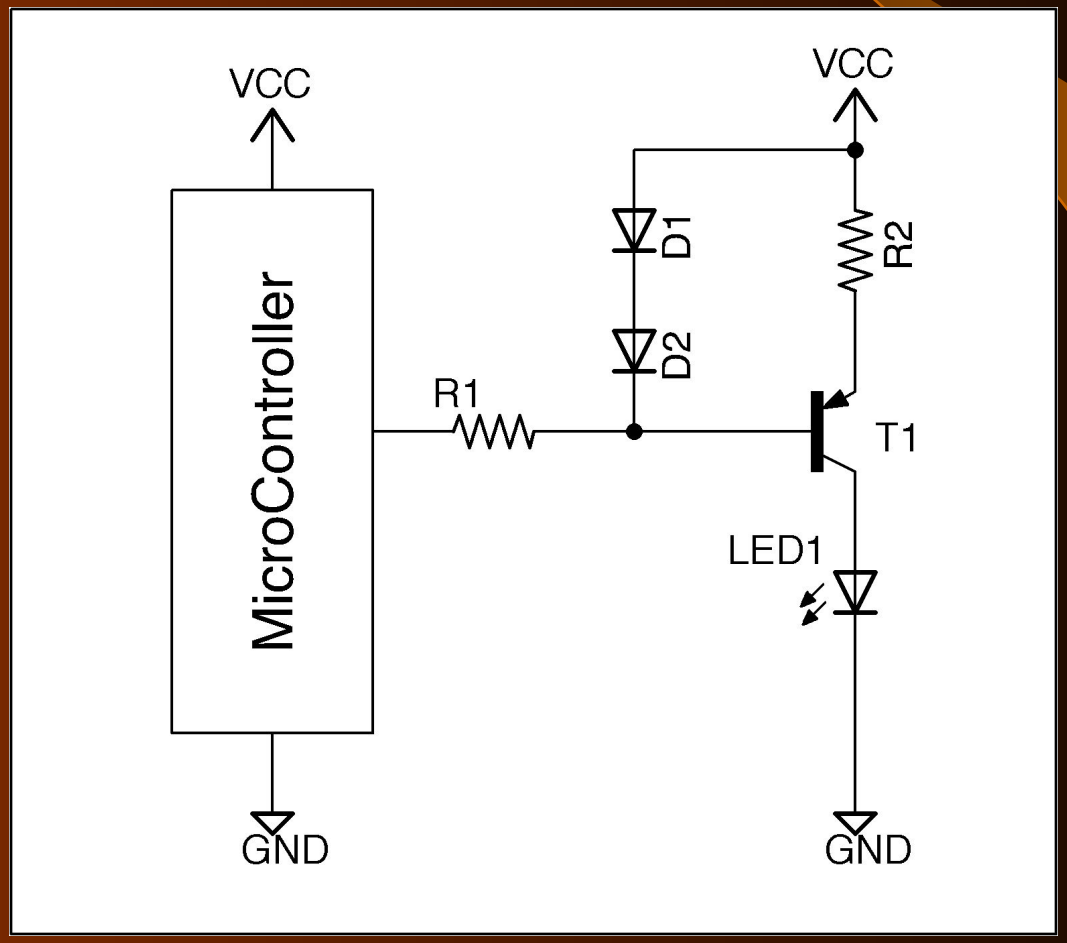
Driving LEDs (Or Other loads): High Side Driver



Driving LEDs (Or Other loads): High Side Driver



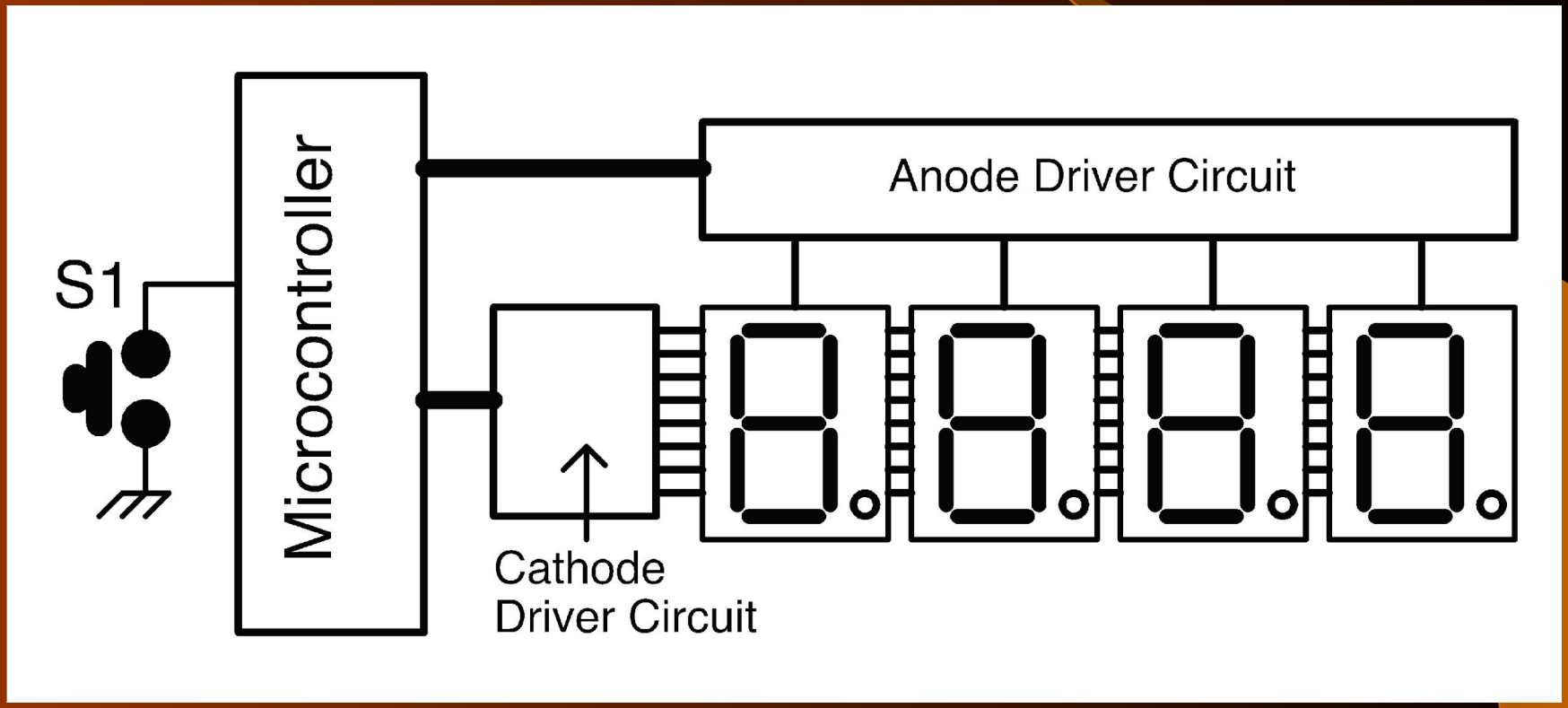
Driving LEDs (Or Other loads): Constant Current High Side Driver



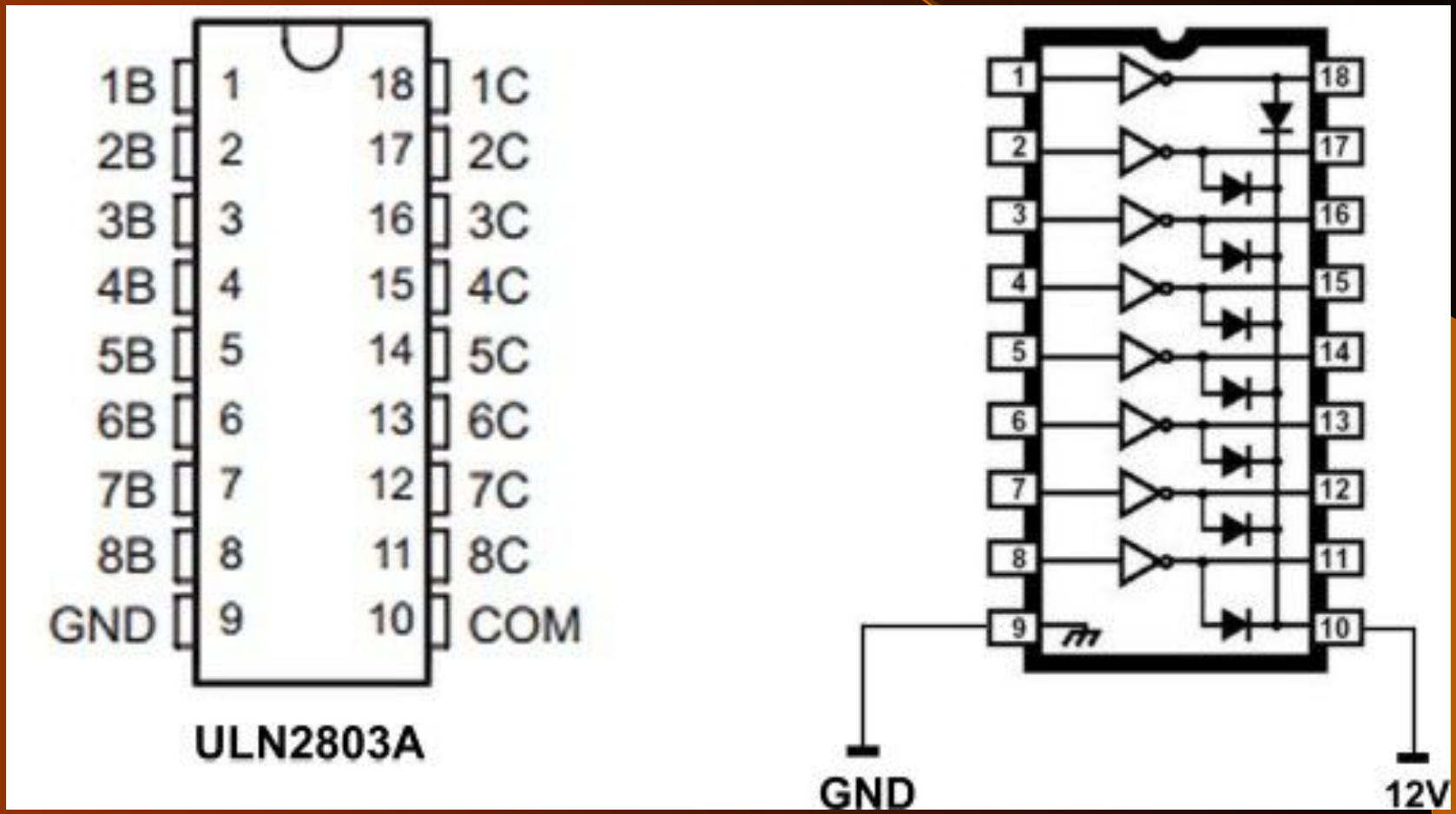
Controlling LEDs

- N pins → N LEDs?
- N pins → (N^2)/4 LEDs? (Multiplexing)
- N pins → N*(N-1) LEDs? (Charlieplexing)

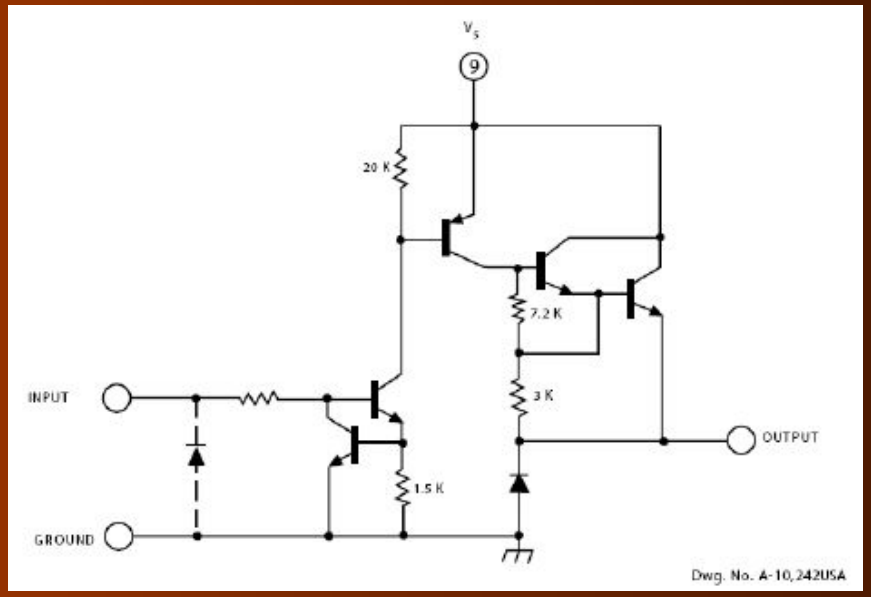
Driving Seven Segment Displays

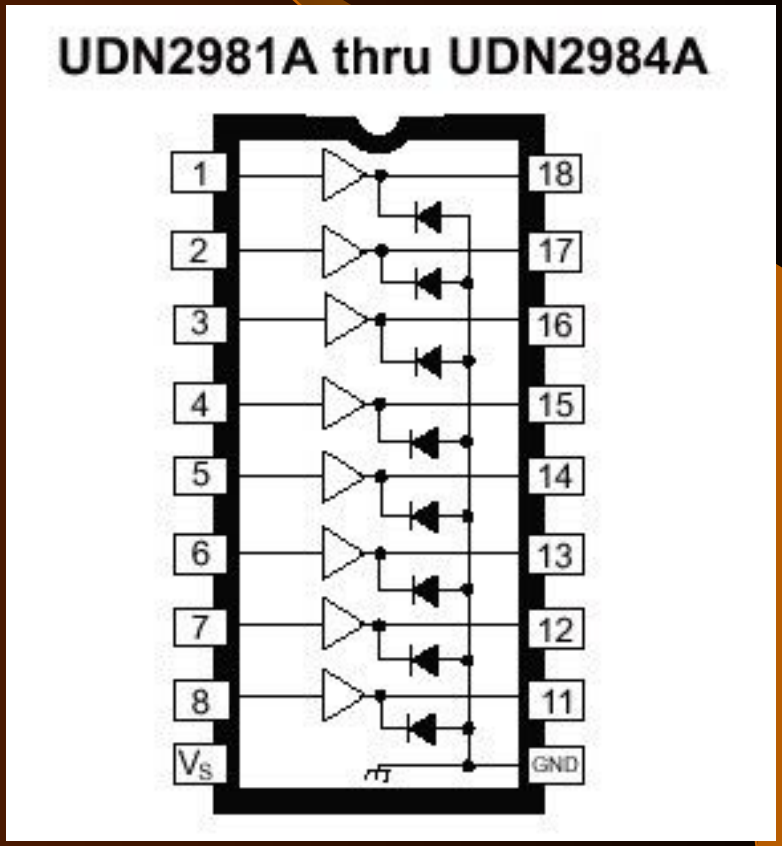


Low Side Driver

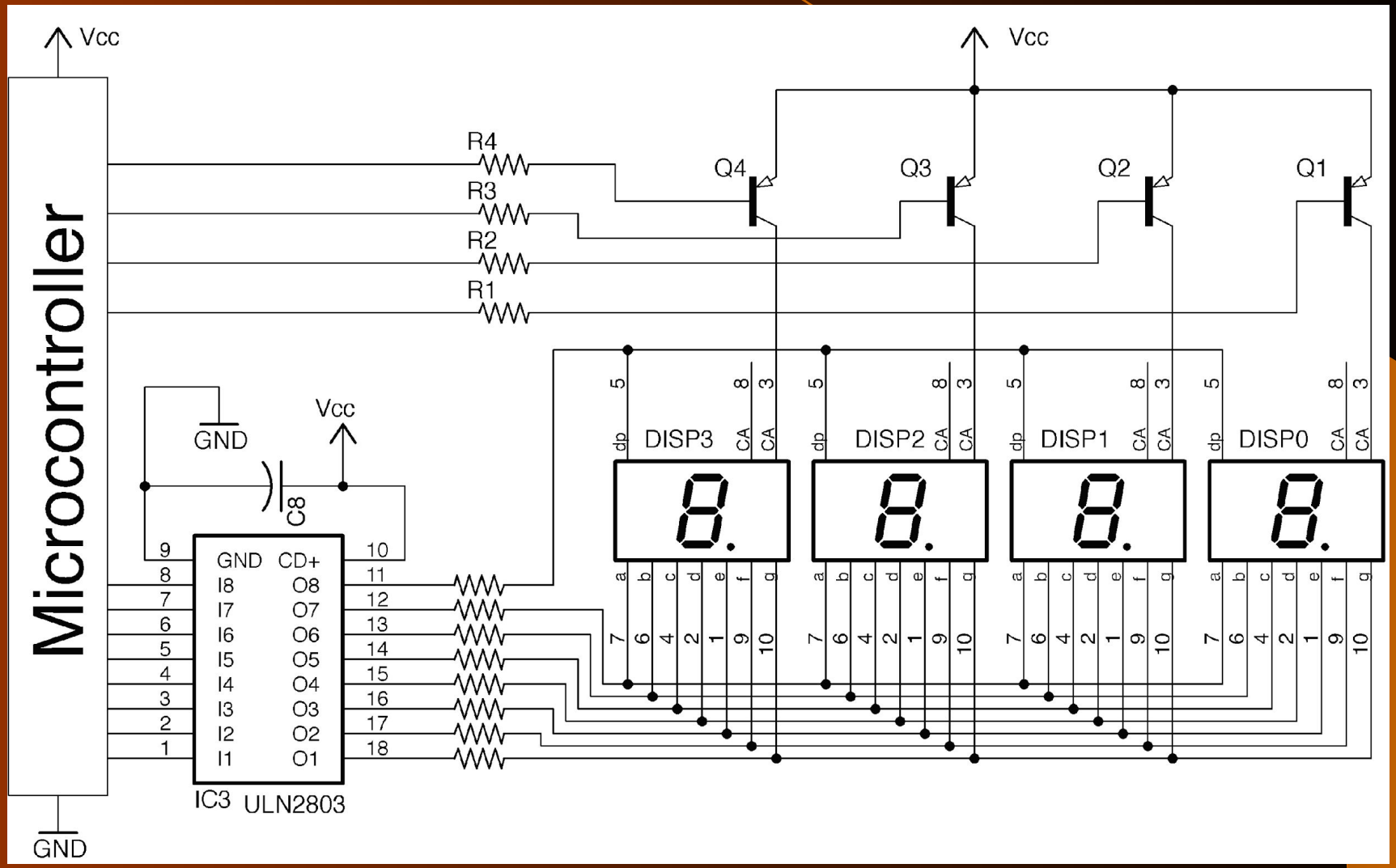


High Side Driver

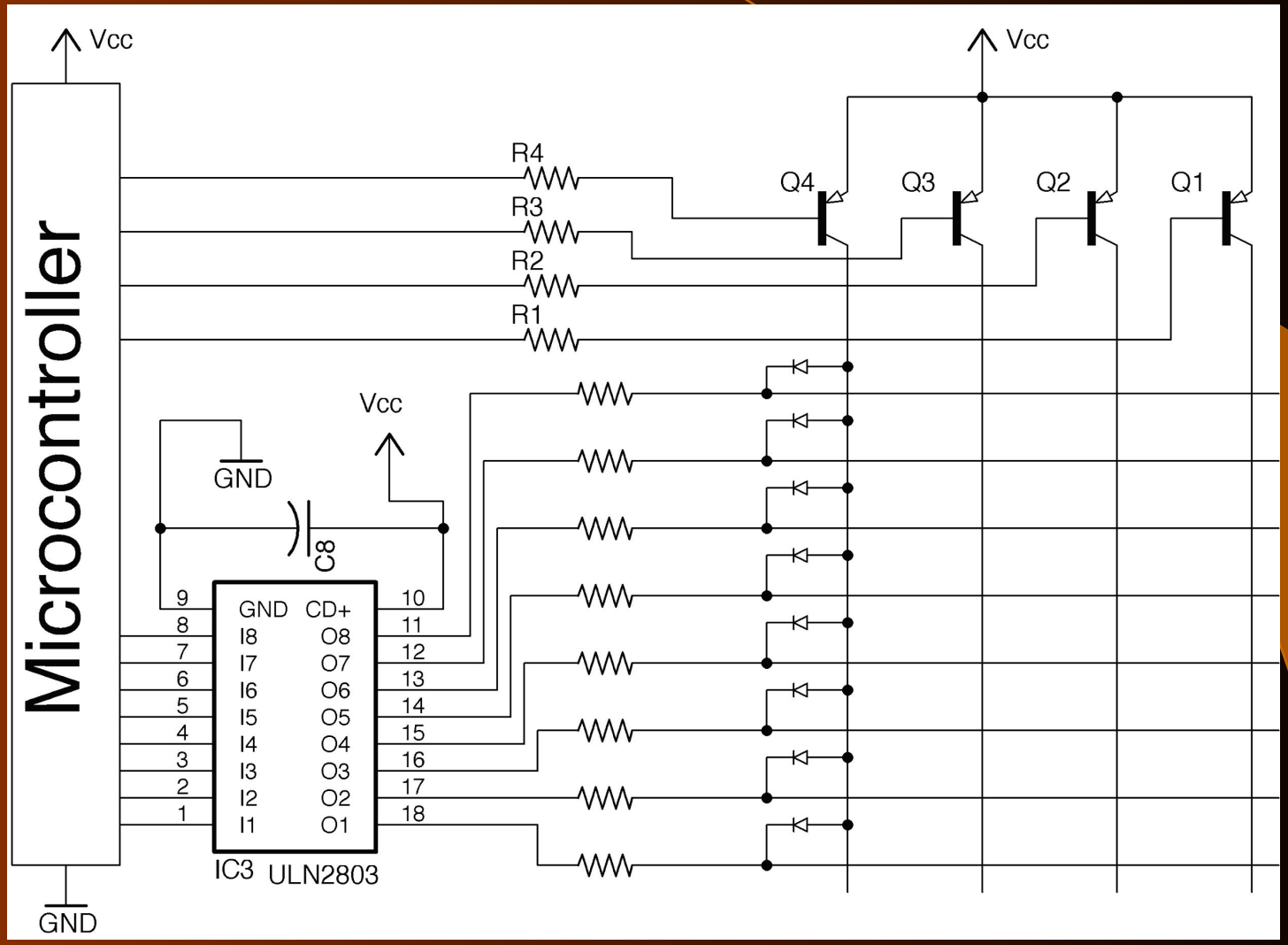




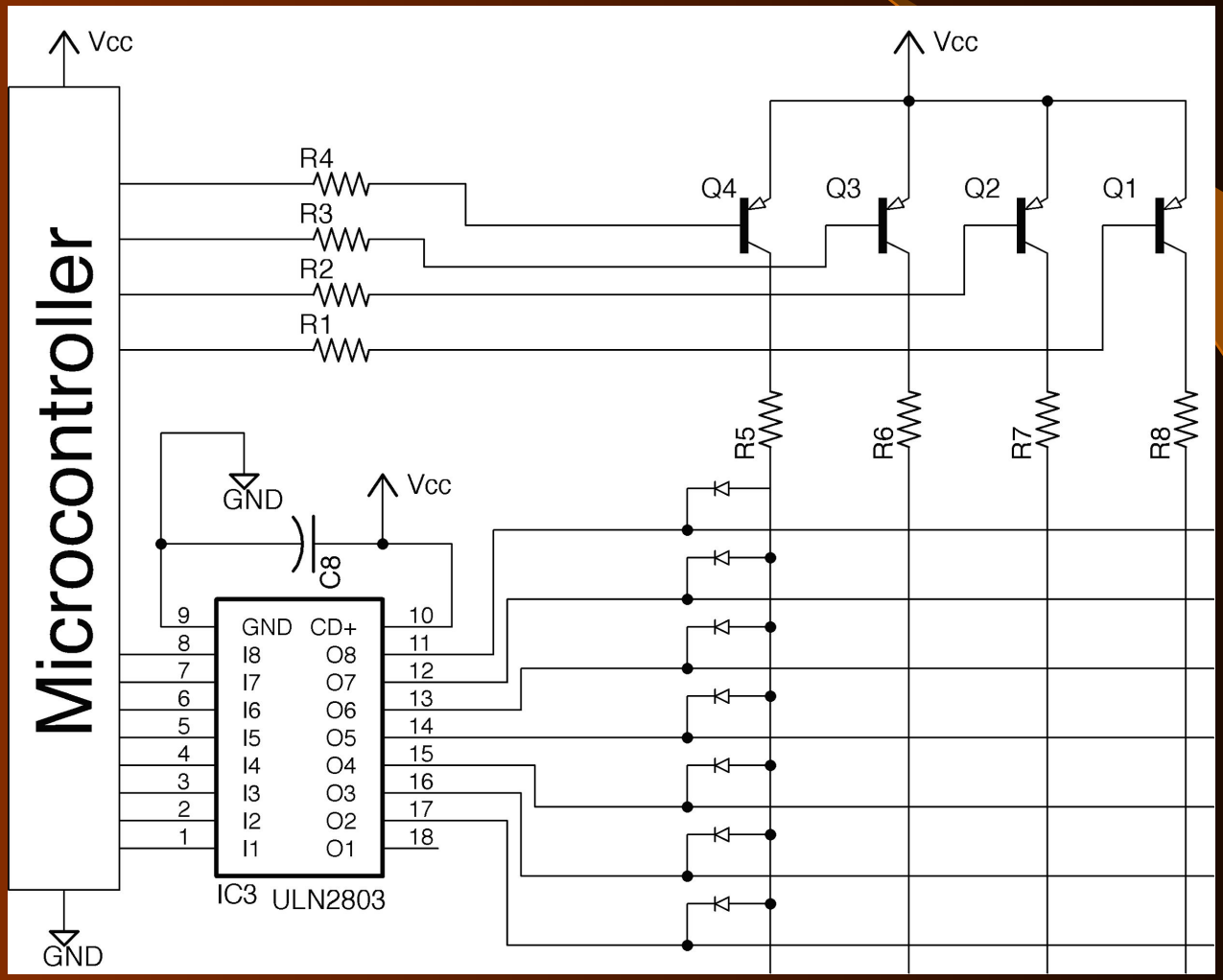
Both Side Switching: Driving Seven Segment Displays



Both Side Switching: Driving Dot Matrix Displays

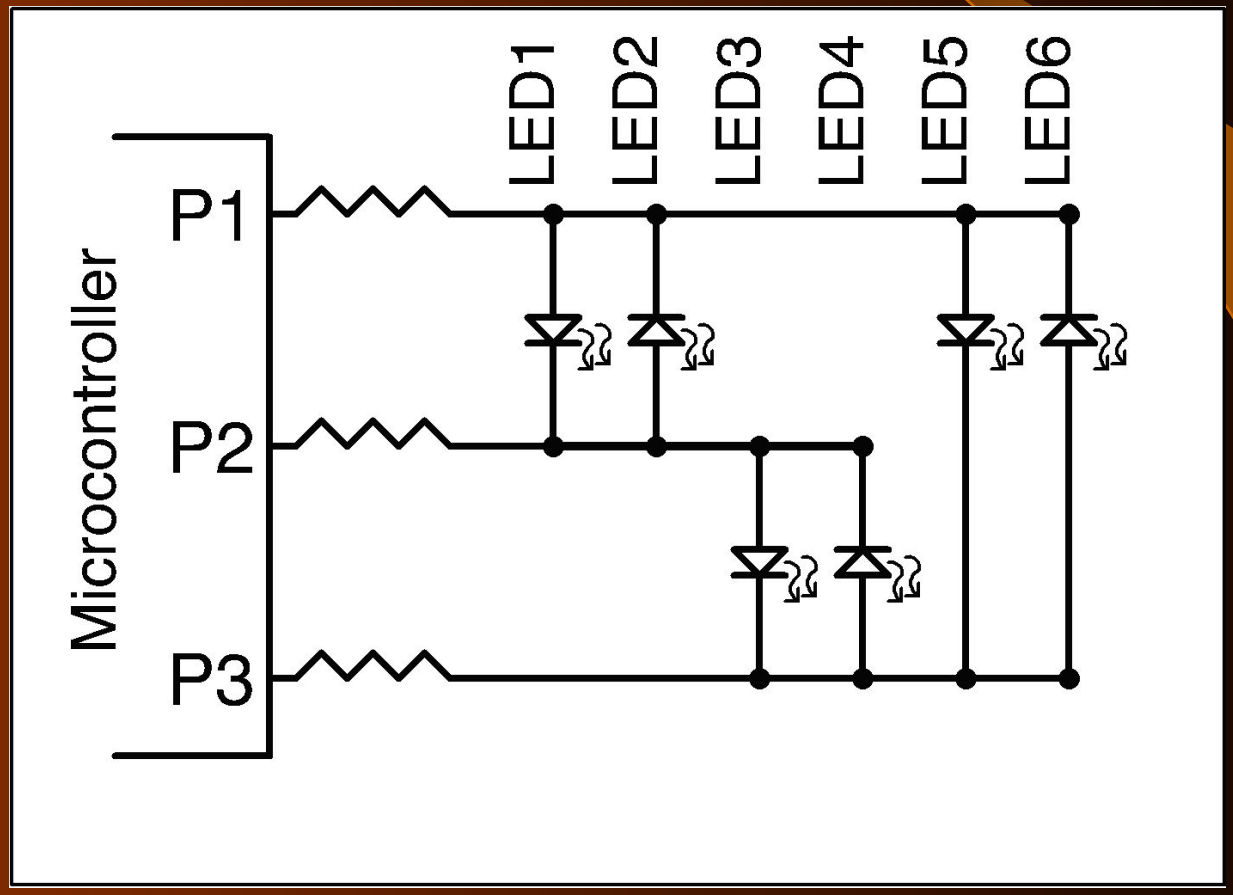


Alternate Method of Both Side Switching

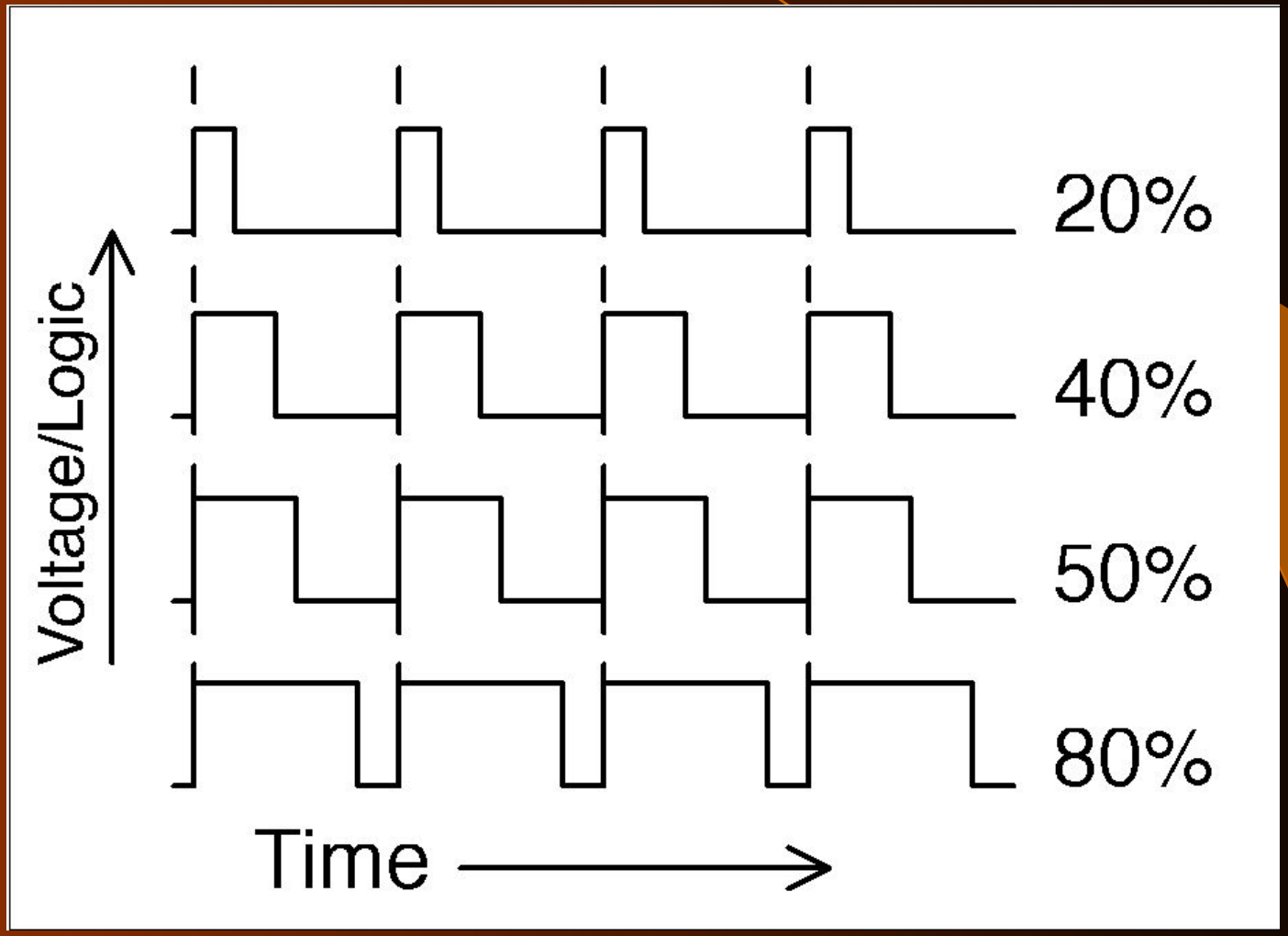


Charlieplexing

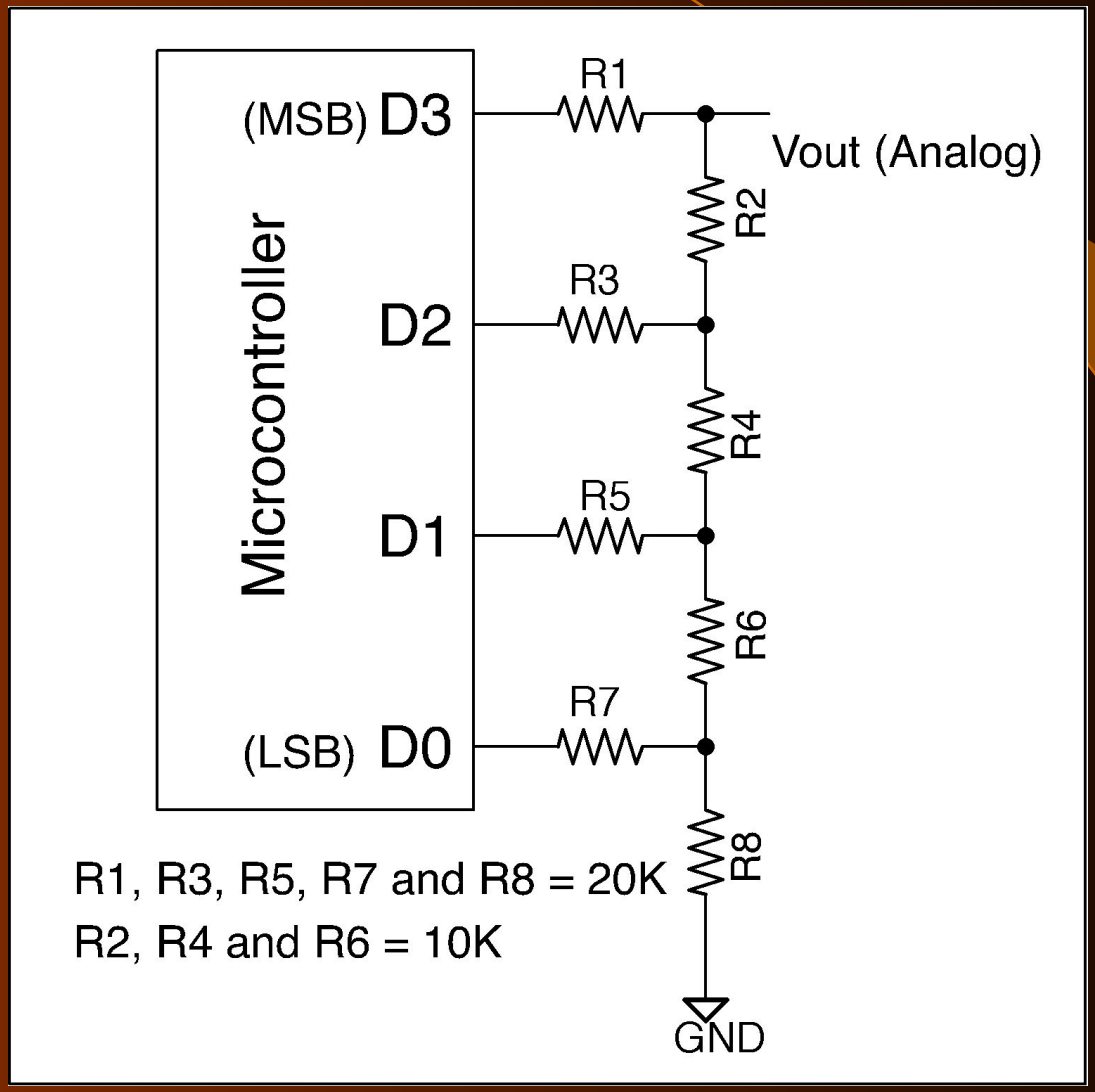
N pins → N*(N-1) LEDs



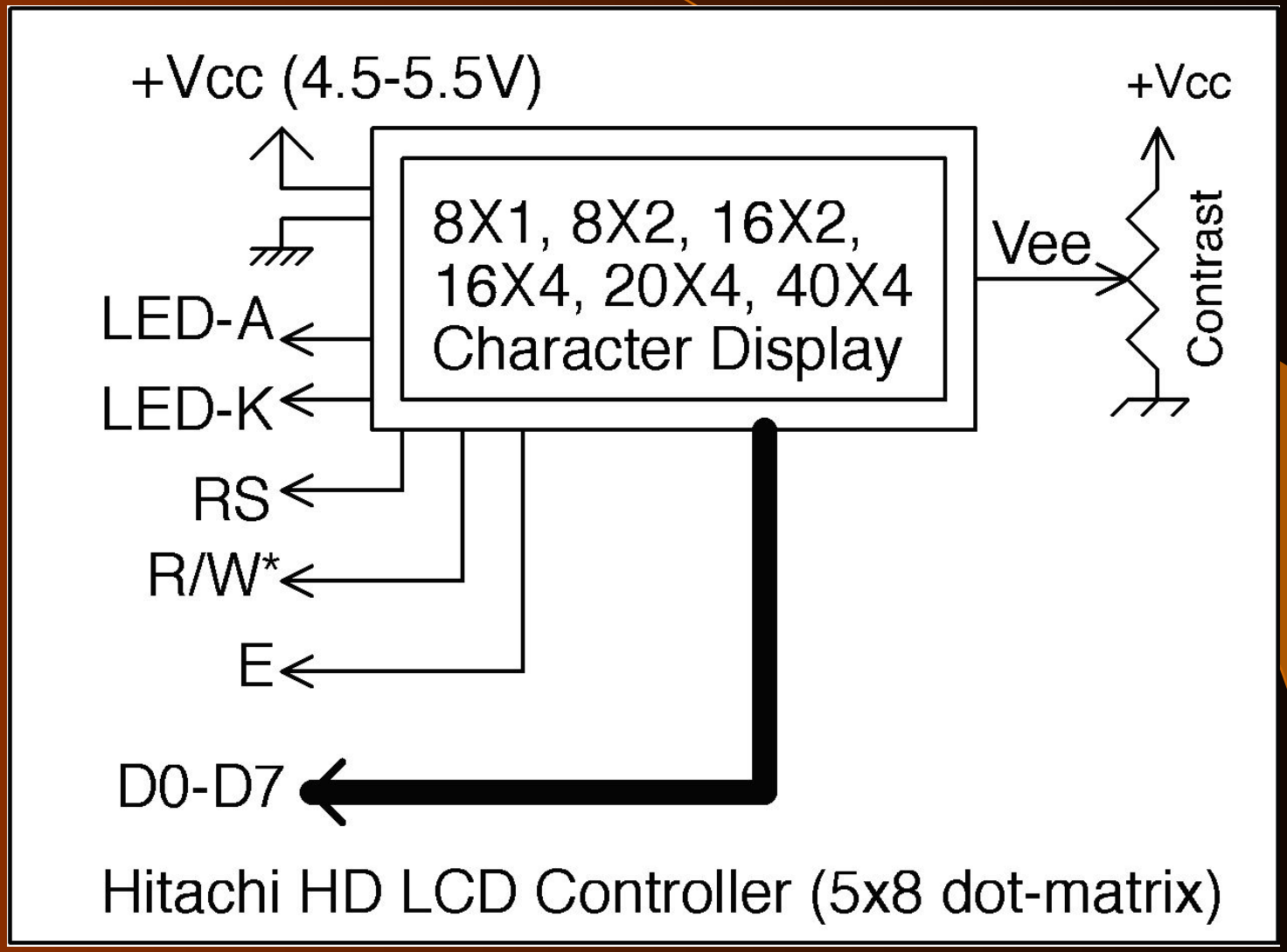
Digital to Analog Conversion: Using PWM



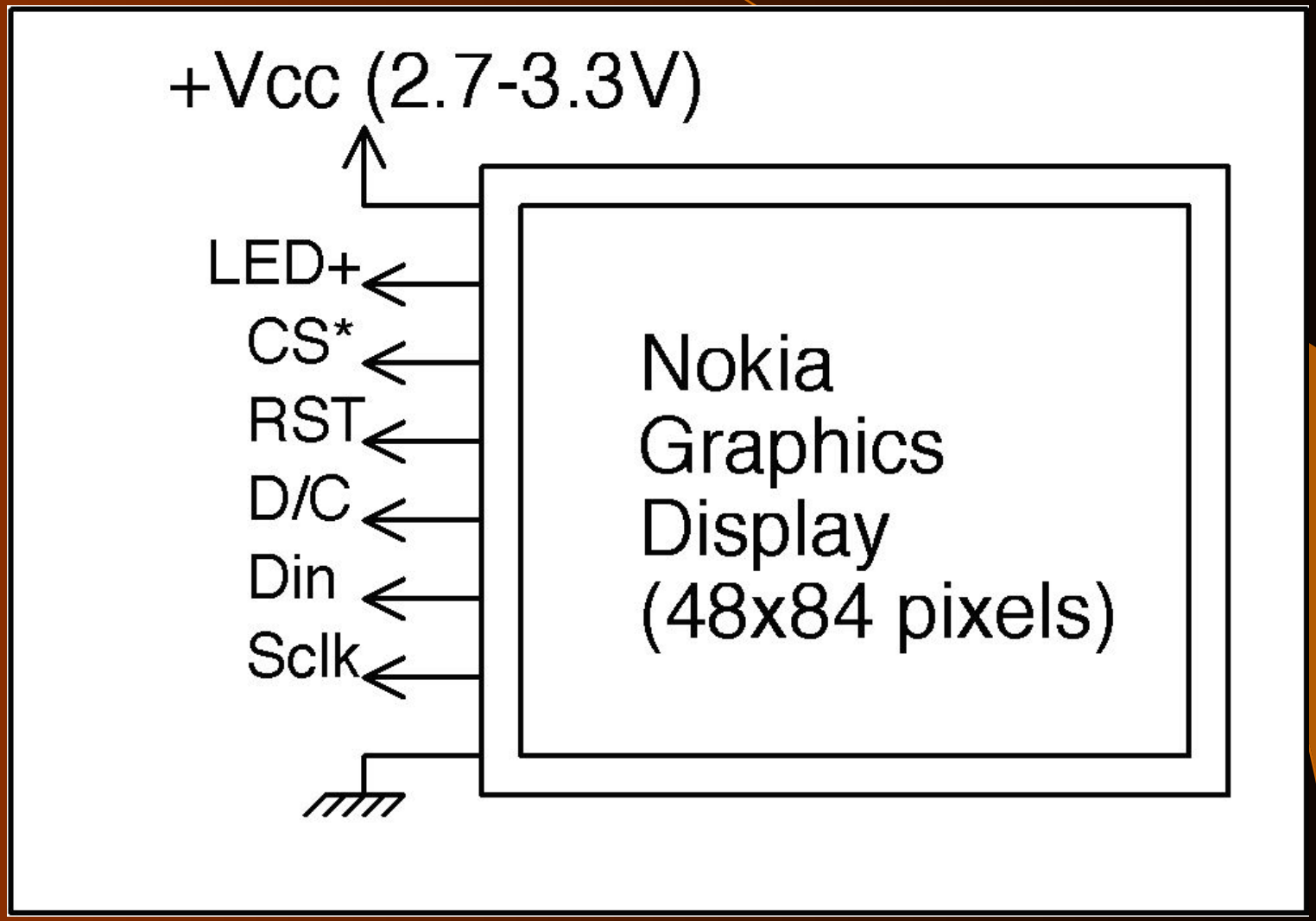
Digital to Analog Conversion: Using R-2R Ladder DAC



Liquid Crystal Displays



Liquid Crystal Displays



Buzzer and Speaker

- Buzzer: In-built driver
- External driver: Tuned circuit actuated using timer.
- Speaker: Transistor switch and Timer
- DAC + Audio amplifier

Ultrasonic

- Piezoelectric element with a strong resonance

Haptic

- DC Motor with eccentric load

Thank you!