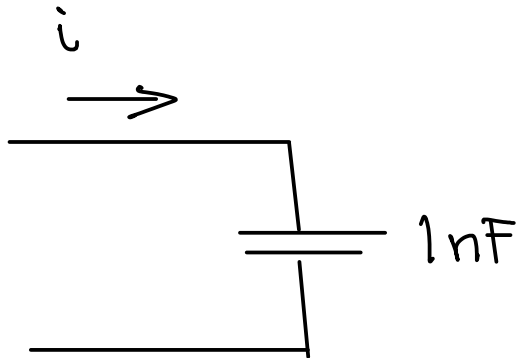


Lecture 6 - Baseband Transmitters and Receivers

Exercise 1: What is the current flowing into a 1nF capacitor if it is being charged at a rate of 10V/ μ s?

$$i = C \frac{dV}{dt}$$



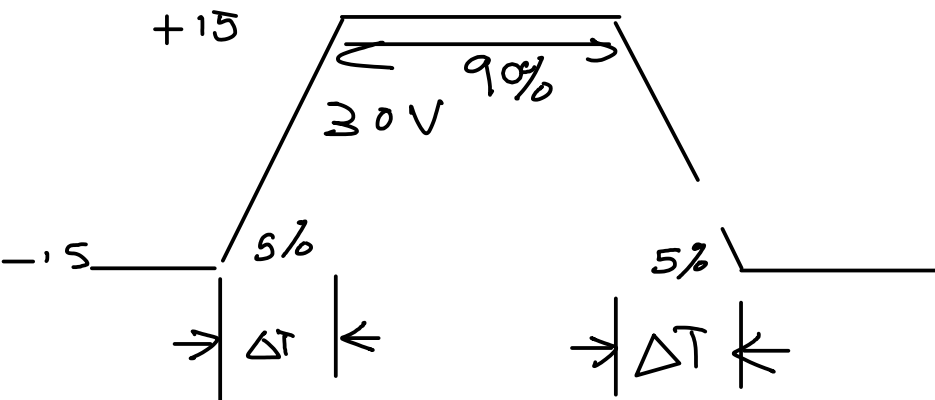
$$\frac{dV}{dt} = \frac{10}{1 \times 10^{-6}} = 10 \times 10^6$$

$$i = 1 \times 10^{-9} \cdot 10 \times 10^6$$

$$= 10 \times 10^{-3} = 10 \text{ mA}$$

Exercise 2: The RS-232 standard specifies a maximum slew rate of 30V/ μ s. Assuming a voltage swing of 30 volts, what is the maximum data rate for which two signal level transitions occupy 10% of the bit period?

What is T_b ?
 f_b ?



$$30 \text{ V}/\mu\text{s} = \frac{\Delta V}{\Delta T}$$

$$\Delta V = 30 \text{ V}$$

$$\Delta T = \frac{\Delta V}{30}$$

$$= \frac{30}{30} = 1 \mu\text{s}$$

$$2 \Delta T = 0.1 \times T_{\text{bit}}$$

$$2 \cdot 1 \mu\text{s} = 0.1 T_{\text{bit}}$$

$$T_{\text{bit}} = 20 \mu\text{s}$$

$$f_{\text{bit}} = 50 \text{ kHz}$$

Exercise 3: If the capacitance of the transmission line joining several OC drivers is 1nF and the pull-up resistor is 1kΩ, how long will it take for the pull-up to pull the line from 0V to 63% of the logic high voltage?

$$\text{time constant} = RC = 1E-9 * 1E3 = 1E-6 = 1\mu\text{s}$$

Exercise 4: What are the consequences of increasing the delay between polls? What other factor might determine the maximum delay before slave gets access to the bus in a system using polling?

- increasing delay \rightarrow may miss events
- bus utilization affects how often we can poll

Exercise 4: When the input to the optocoupler is high, will the output be high or low? Assume a pull-up is connected to the output.

input high \rightarrow LED on \rightarrow transistor ON \rightarrow output pulled low

Exercise 5: What is the active termination supply voltage for bipolar signalling?

to minimize average power consumption, assuming equally likely H and L, use 0V termination voltage.