

ECE 340: Diode simulation notes

day13

1. Hand analysis and plotting videos

- Circuits A and B: [Diode circuit waveforms, part 1](#)
- Circuits C and D: [Diode circuit waveforms, part 2](#)

2. Class time

2.1. Review hand calc process

From [day12](#)

- ☐ Example 2 (instructor)
- ☐ Example 3 (students)
- ☐ Example 4 (students)

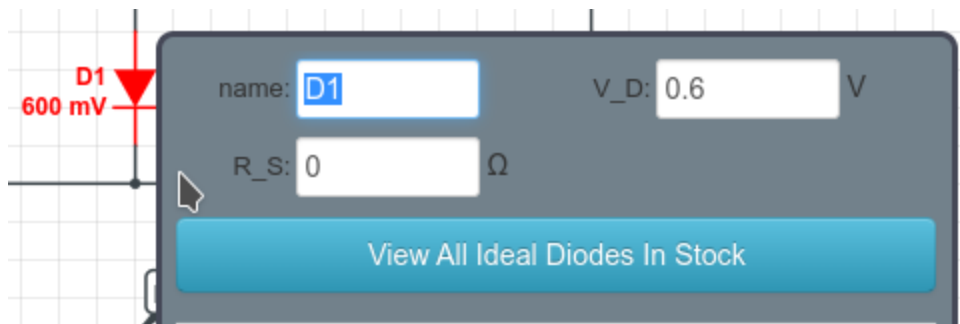
2.2. Simulator solution

Open [CircuitLab](#)

- ☐ Draw and solve the circuits of [day12](#) Examples 1, 2, 3, 4

Open this CircuitLab schematic, the same as the [diode waveforms handout](#) :

[Diode waveforms simulation](#)

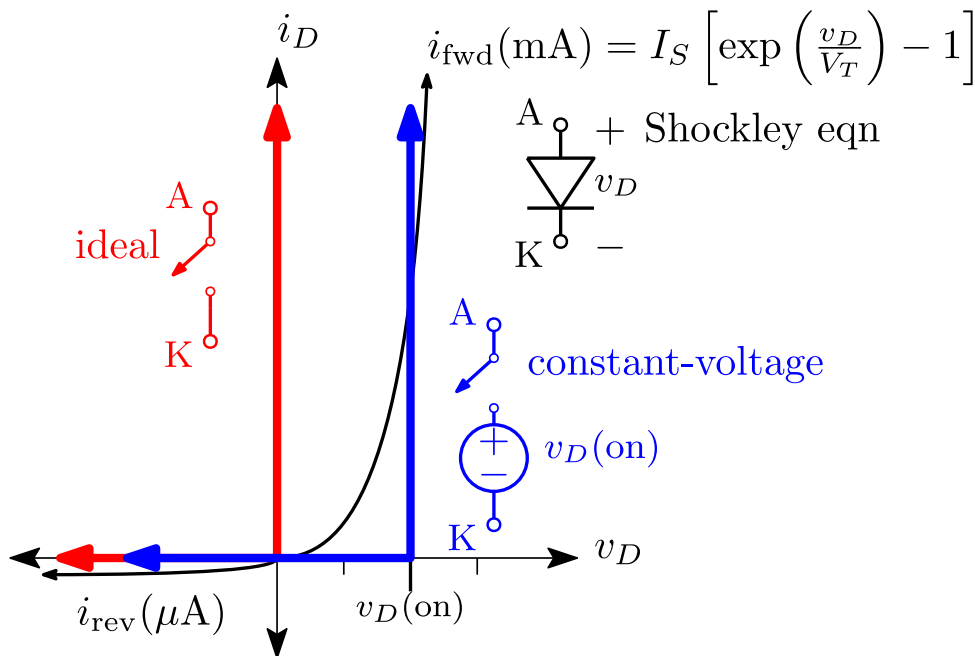


Double-click on **D1** and **D1a** to see the parameters that are configured.

D1 is CircuitLab's "ideal diode", and behaves the same way as the **ideal** or **constant-voltage** models from the color figure depending on the value set for V_D .

D1a is set to the default realistic diode model for a 1N4148.

- ☐ Hover over the nodes and you will notice that everything is 0 V. This is because the DC solver is using the $t = 0$ seconds value for the voltage sources, which is 0 V.
- ☐ Click the **Simulate** button near the lower left corner.



2.3. Time-domain simulation

The simulation is already configured to run a **Time Domain** simulation from 0 to 10 ms with a time step of 10 μ s.

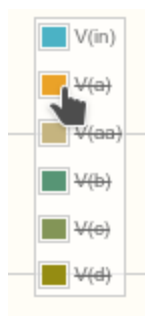
- PSpice, LTspice, and most other simulators call this a **Transient** analysis.
- **YOU** must choose a good value for the **Time Step**!
 - Too *large* of a step gives bogus and misleading results.
 - Choose a *small enough* time step so that the waveform has enough samples to trace an accurate shape of the “fastest” edges in your circuit.
 - Too *small* of a step means that the simulator needs to compute a TON of points ... which can take a long time.

How many time steps will the simulator compute in this situation?

- What happens if Time Step == (Stop Time - Start Time) ?

The node voltages to plot are already configured.

2.4. Run the simulation



- ☐ Run the simulation, which opens the waveform data plot.
- ☐ Deselect all of the waveforms except for **V(in)**.
- ☐ Add back **V(a)**.

The **V(a)** waveform is an **exact** match to the hand analysis solution! This is a great way to check your hand drawings!

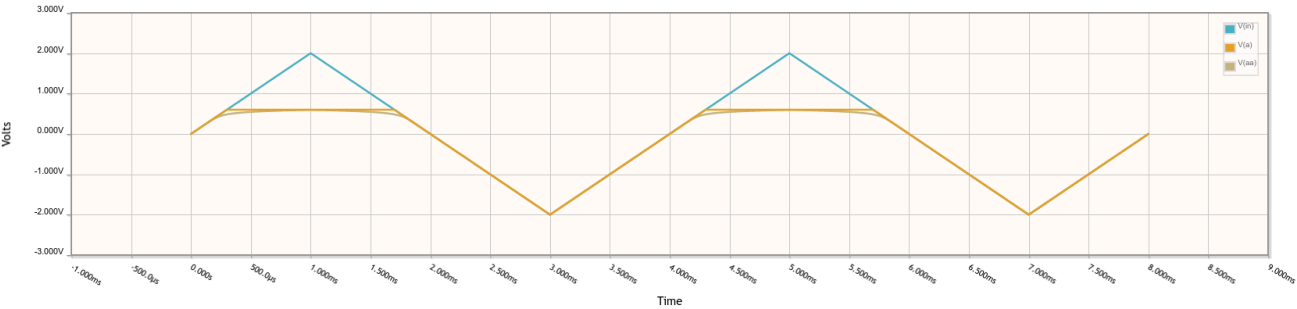
- ☐ Add **V(aa)** also, then remove **V(in)** so you only see the two Circuit A waveforms.

Is 0.6 V a good choice for $V_{D,on}$ in this particular circuit?

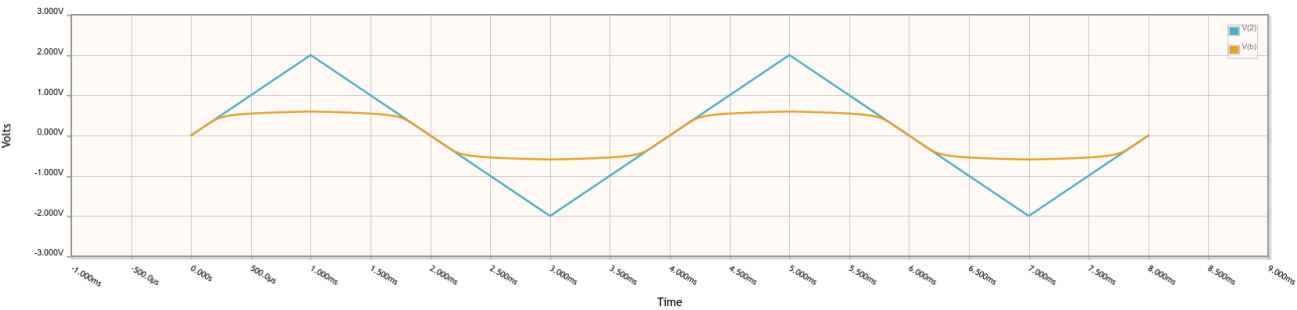
- Is there a *one-true-best* value for $V_{D,on}$?

3. Circuits

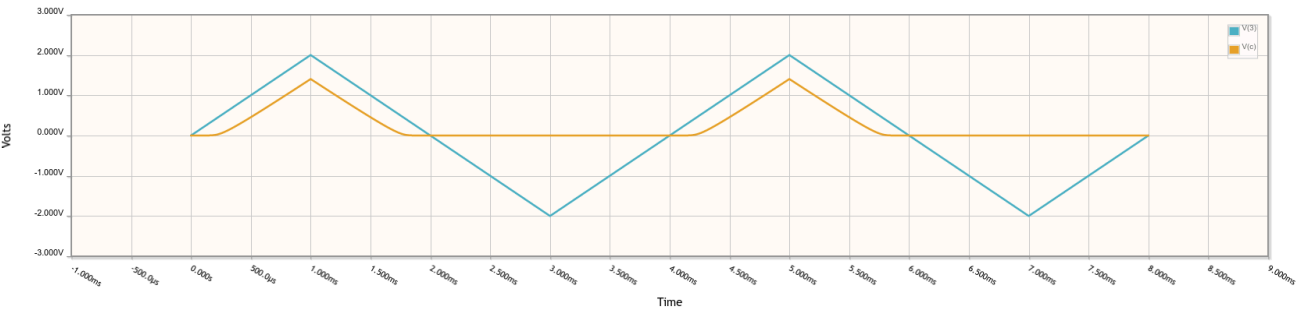
3.1. Circuit A



3.2. Circuit B



3.3. Circuit C



3.4. Circuit D

