

Title: Design the full differential biphasic stimulator

Due Date: Friday, March 18th at 11:59pm. Please submit your report online. Note, for this project, *you can have a project partner if you want.*

Description: As discussed in class, this project is simply an extension of the previous project. In project 2, you design the current sink. In this project, you are to complete the design of the current source and the switches that go with the current source. All other specifications from project 2, such as the current output, the electrode model and the clock frequency all remain the same. In addition, you need to do some layout. You will be required to layout either the current sink, or source, along with the accompanying op amp. However, you do not need to layout the entire circuit including both the current sink and source, as well as both op amps.

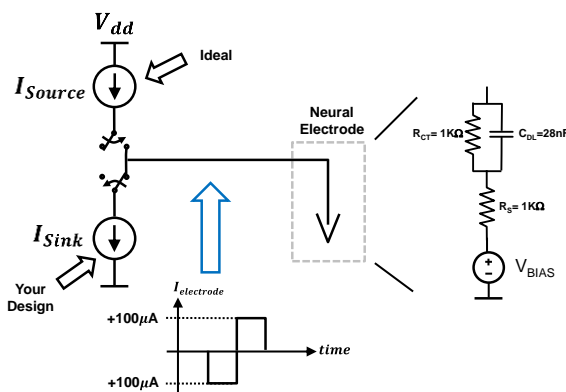


Figure 1: High-Level Diagram of the current sink driver stage for neural stimulators. Sink and Source currents should be designed for $100\mu\text{A}$. Values for the Electrode model are - $C_{DL}=28\text{nF}$, $R_S=1\text{K}\Omega$, $R_{CT}=1\text{G}\Omega$. You may choose any value for V_{BIAS} .

You should write a two-page report that contains the following content:

- **Introduction:** which describes the challenges of building your circuit and what alternative solutions have been published.
- **Design:** a detailed description of your design, please emphasize any novelty in your design.
- **Results:** please use clear figures to show your Cadence simulation results with a clear discussion of the results.
 - Please fill out the attached table. Part of your grade will depend on how well you match the up (source) and down (sink) currents, the overall power consumption and the total area occupied by your design. For the area, you

can make a table with all the device sizes. Add up the area of all your device area and put into the table.

Total power consumption	Sum of the transistor areas	Charge Mismatch	Voltage Supply	Max. Voltage Output Swing

- Show time domain simulations of the up and down current pulse and voltage waveforms.
- For the layout that you are doing (only one op amp and only one current source or sink), please do a screen capture of:
 - The layout.
 - Screen capture showing you passed LVS and DRC for all layout that you've done.
 - Extracted view simulations. This would be for the time domain simulations described above.
- **Conclusions:** Type up a brief paragraph of concluding comments. You may add another paragraph to describe what you would have done differently if you had more time to design this circuit.
- **Appendix:** You may use an additional page for figures.