A Simple Way to Extend the Common-Mode Input-Voltage Range of the MOS Differential Pair

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Mixed Analog-Digital VLSI Circuits and Systems Lab
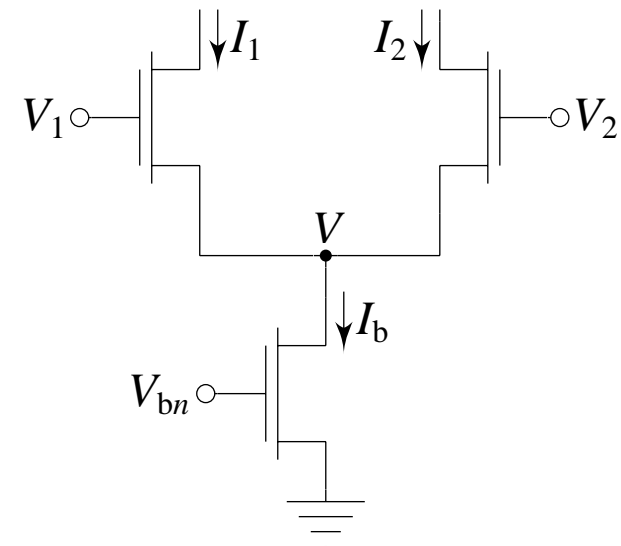Cornell University
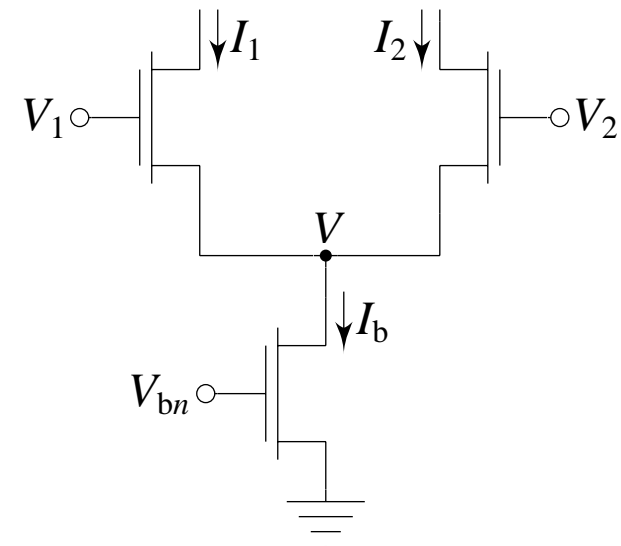Ithaca, NY 14853–5401

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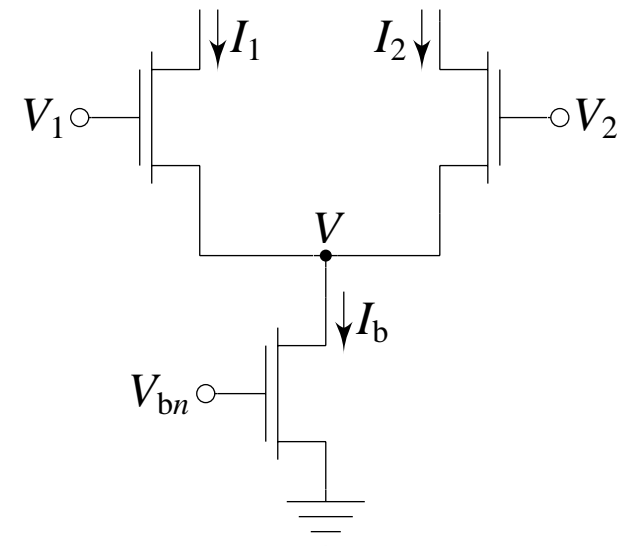
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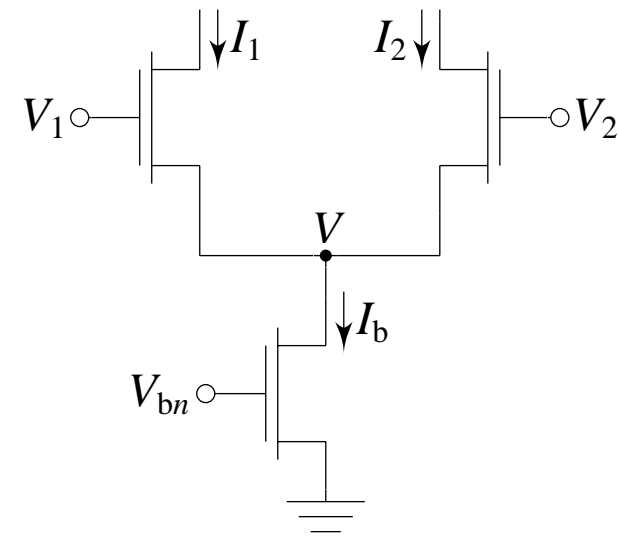
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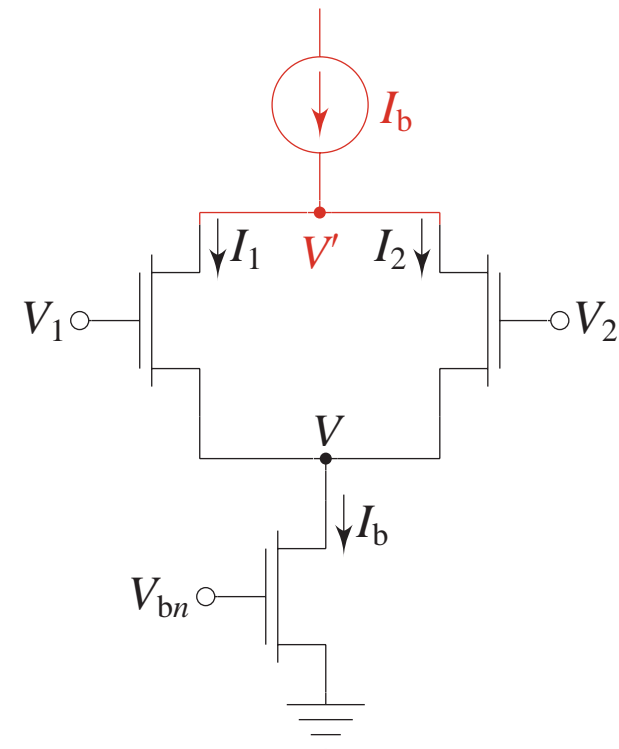
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- The nMOS diff pair has a lower limit on V_{cm} of about a diode drop plus a saturation voltage.
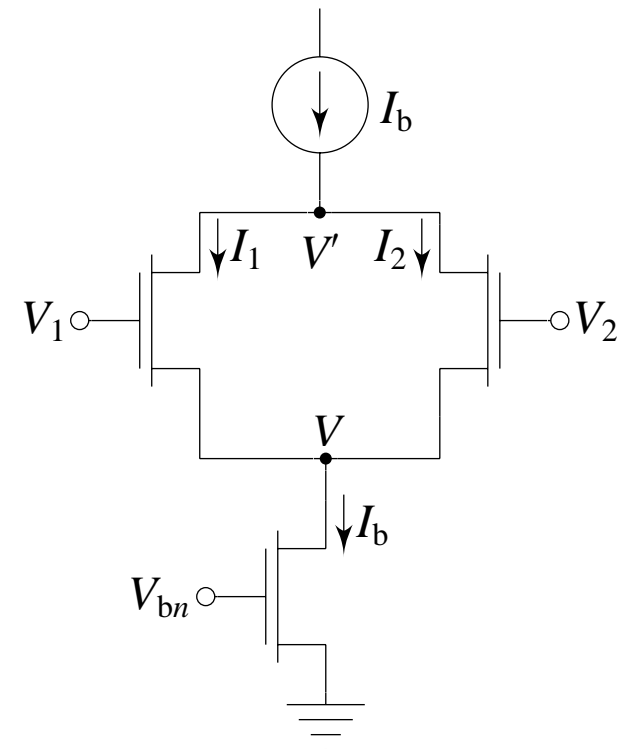
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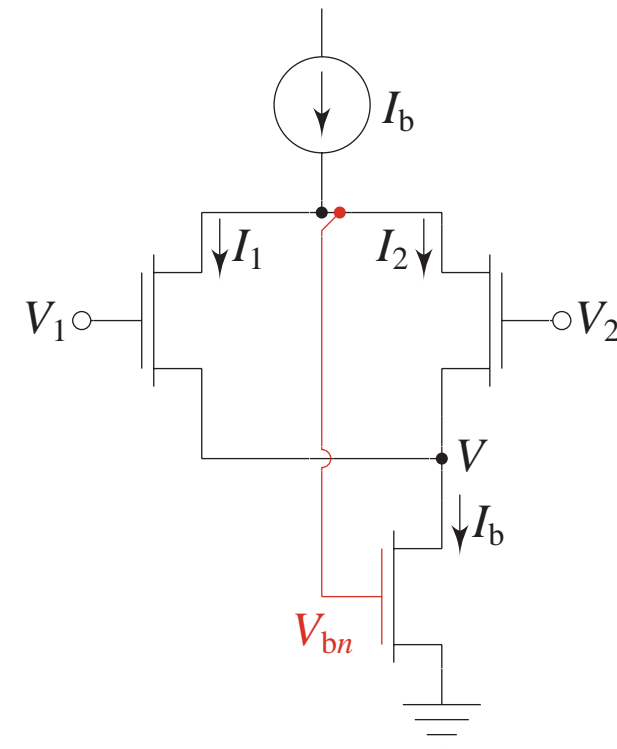
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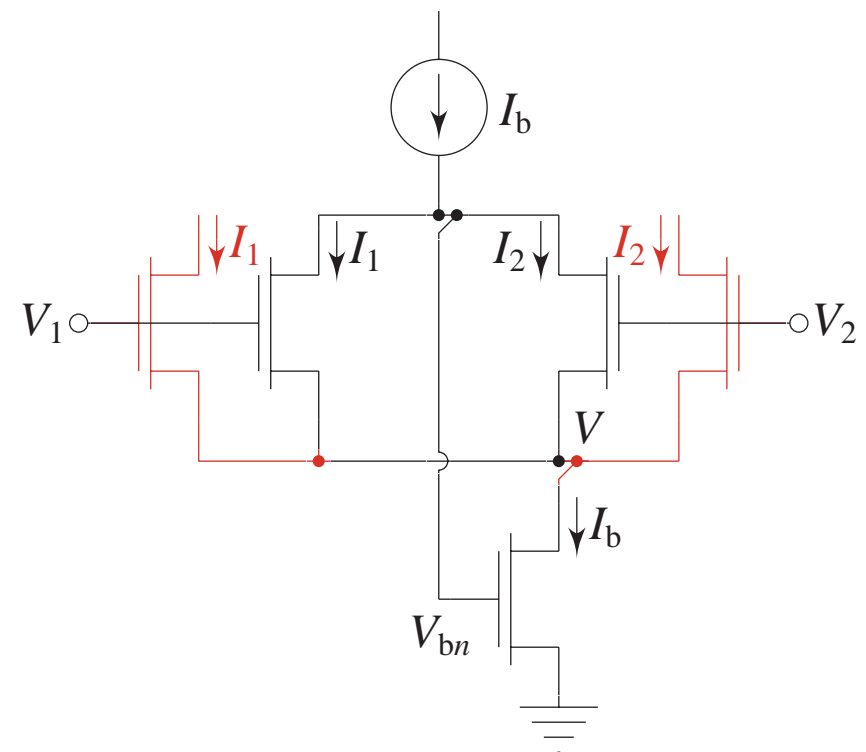
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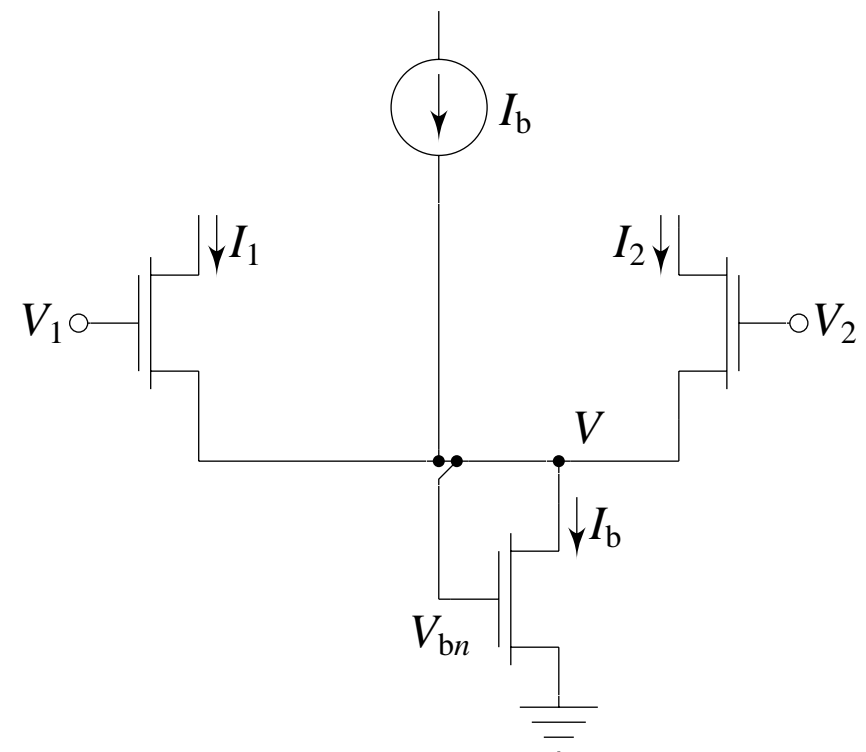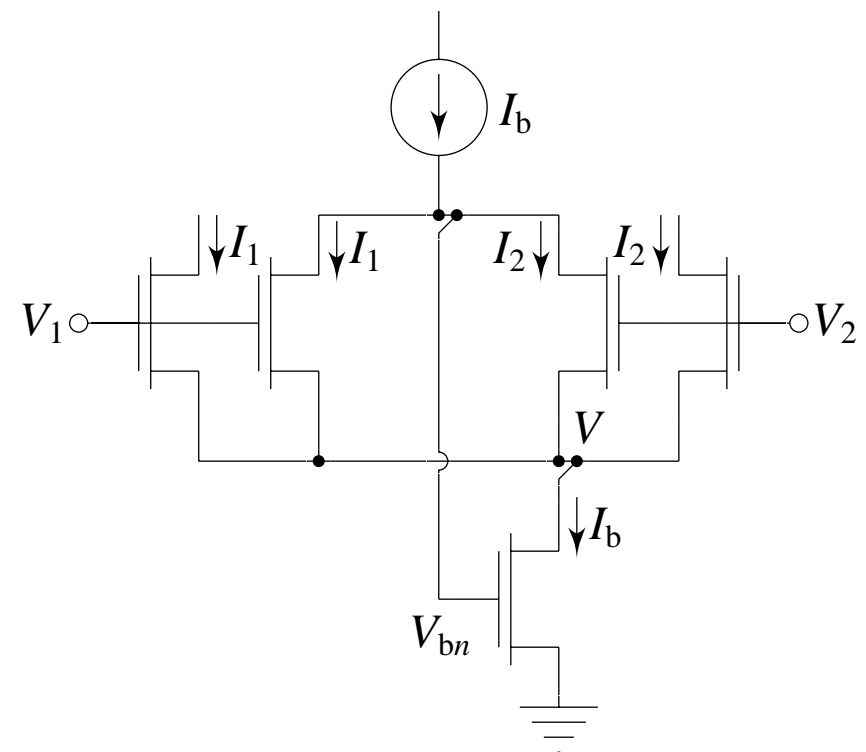- We call this circuit the *flipped differential pair* after Ramírez-Angulo *et al.*
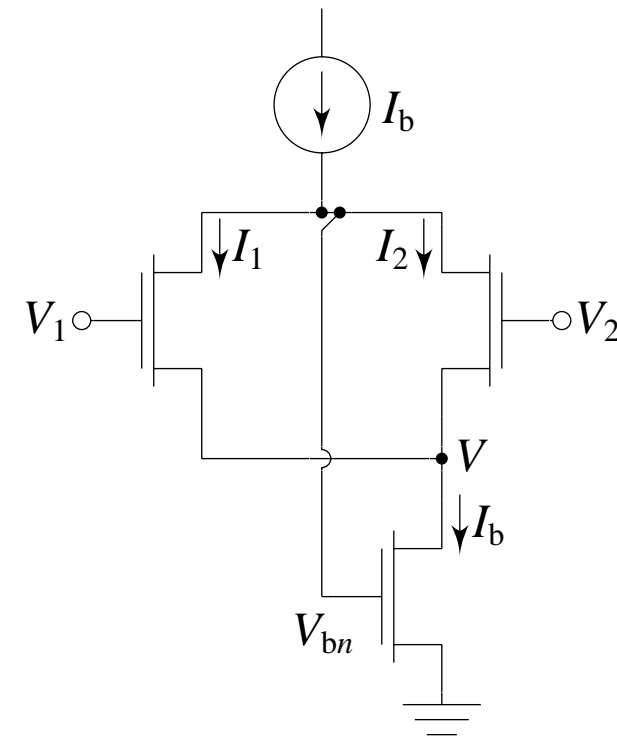
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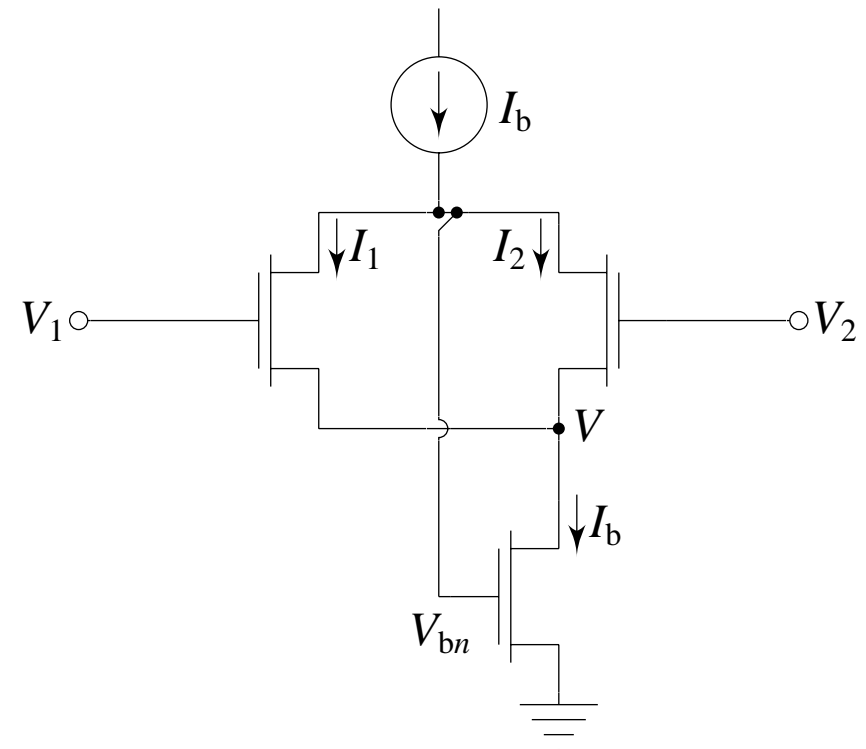
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- As V_{cm} increases, V hits $V_{\text{b}n}$, driving the central pair out of saturation. Beyond this point, the circuit behaves as that shown.

- Nonetheless, this diff pair is useful when V_{DD} is less than about two diode drops.
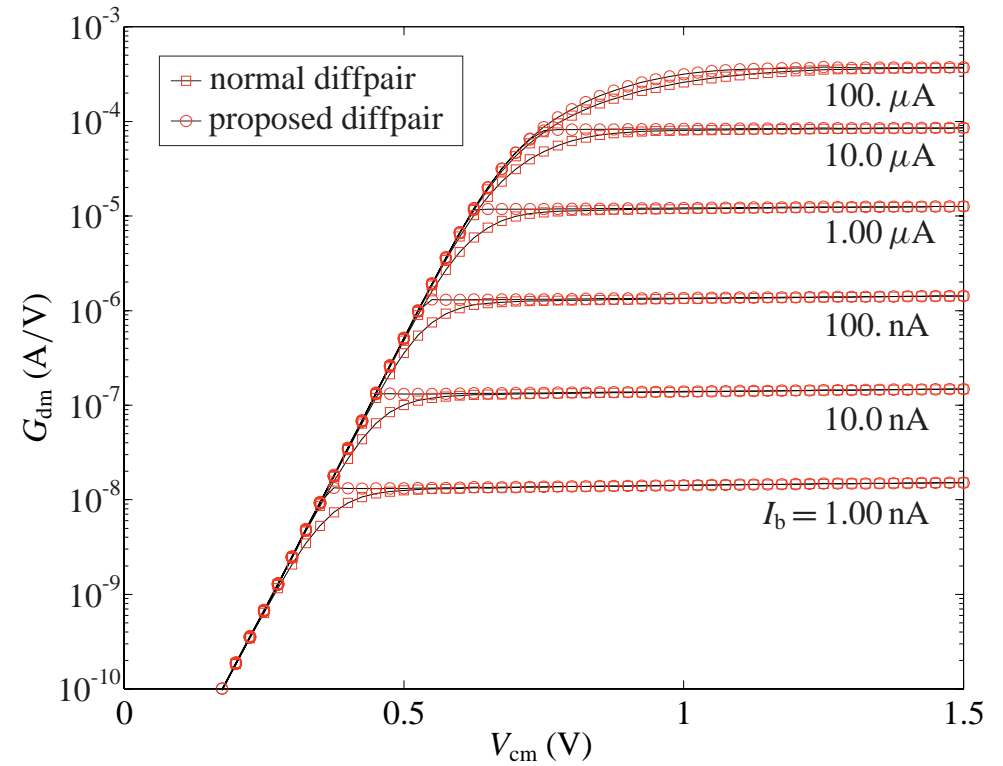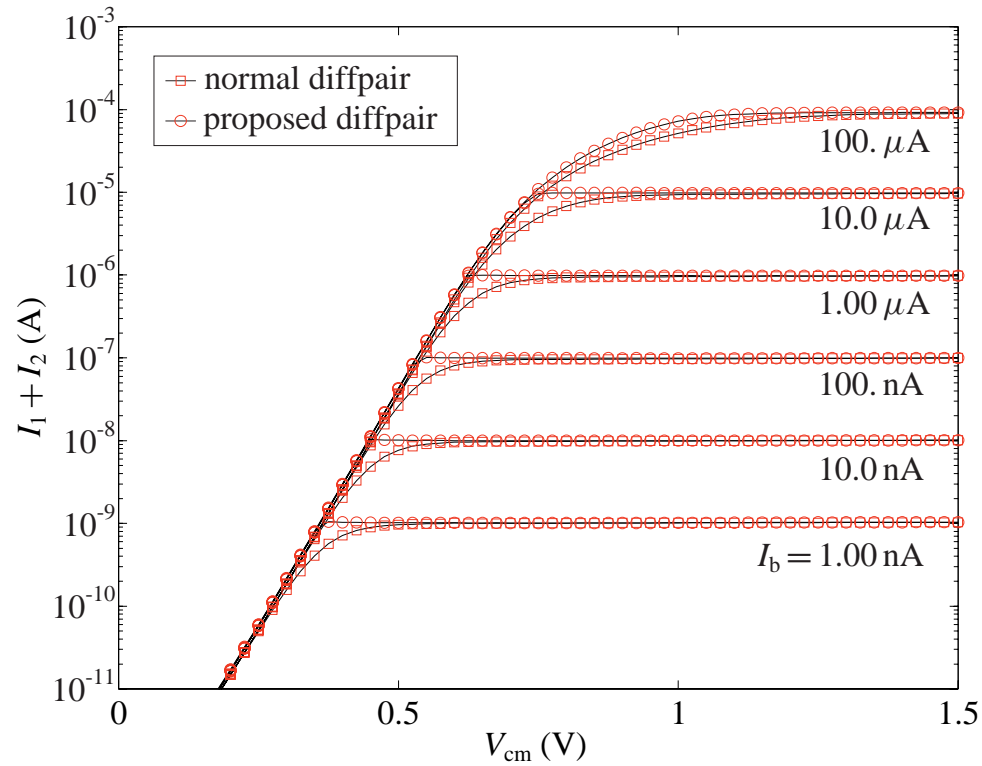
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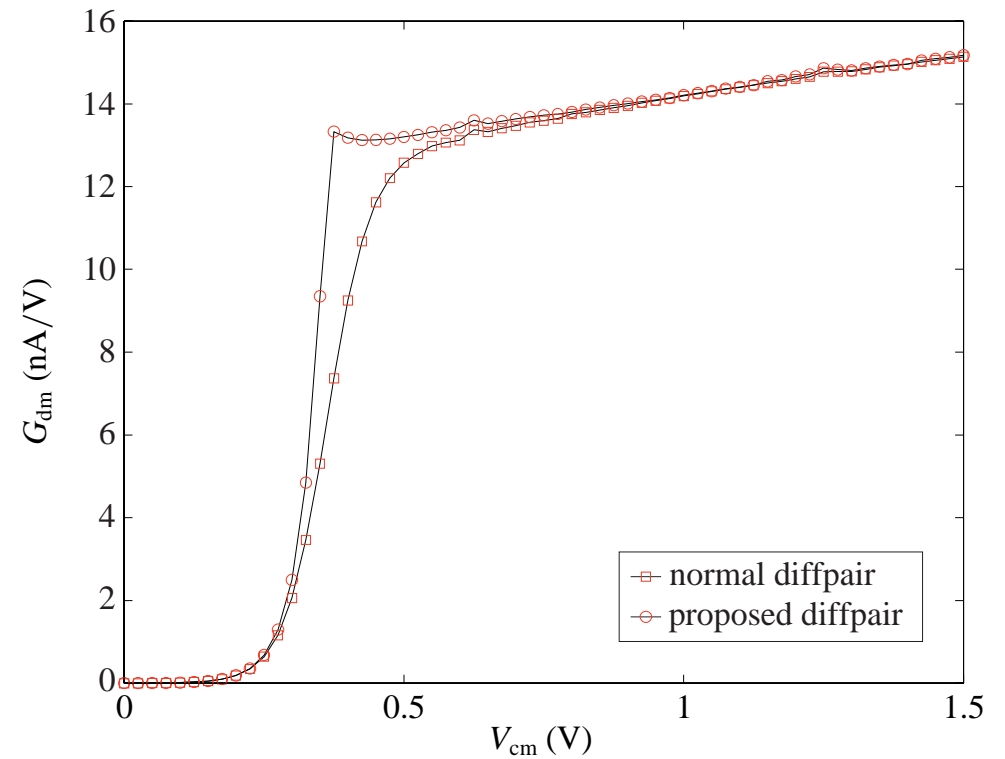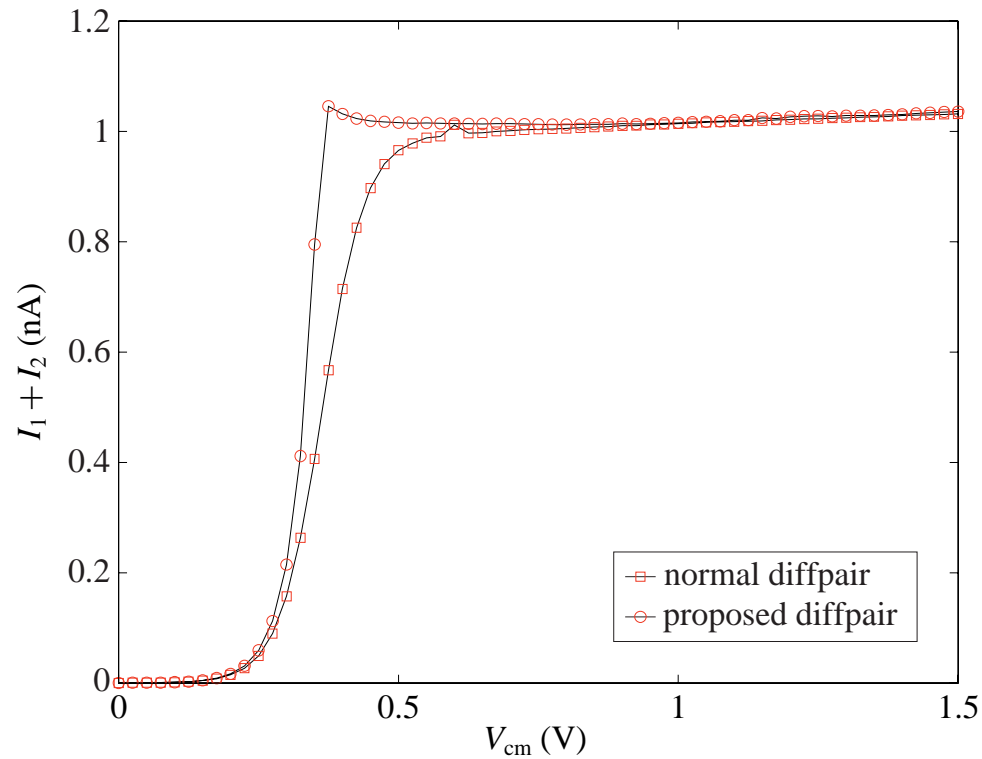
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- For high V_{cm}, the flipped diff pair behaves effectively as a diode connected transistor, and the normal diff pair behaves as ususal.

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- For high V_{cm}, the flipped diff pair behaves effectively as a diode connected transistor, and the normal diff pair behaves as ususal.

- For low V_{cm}, the central pair is saturated, $V = V'$, and V_{bn} adjusts itself to keep $I_1 + I_2 = I_b$, even if $V = V' \leq V_{DSsat}$.
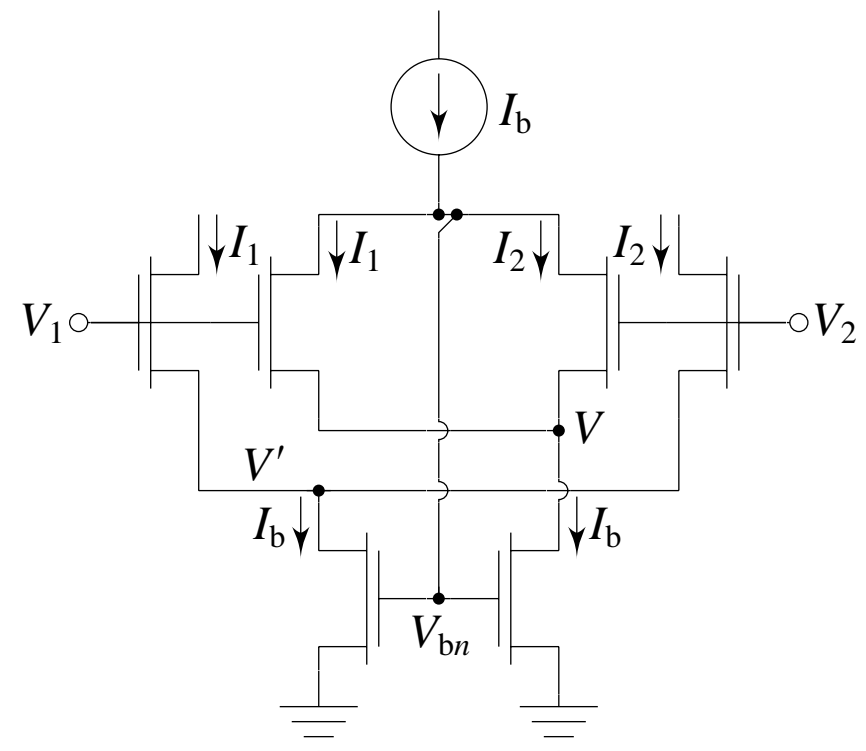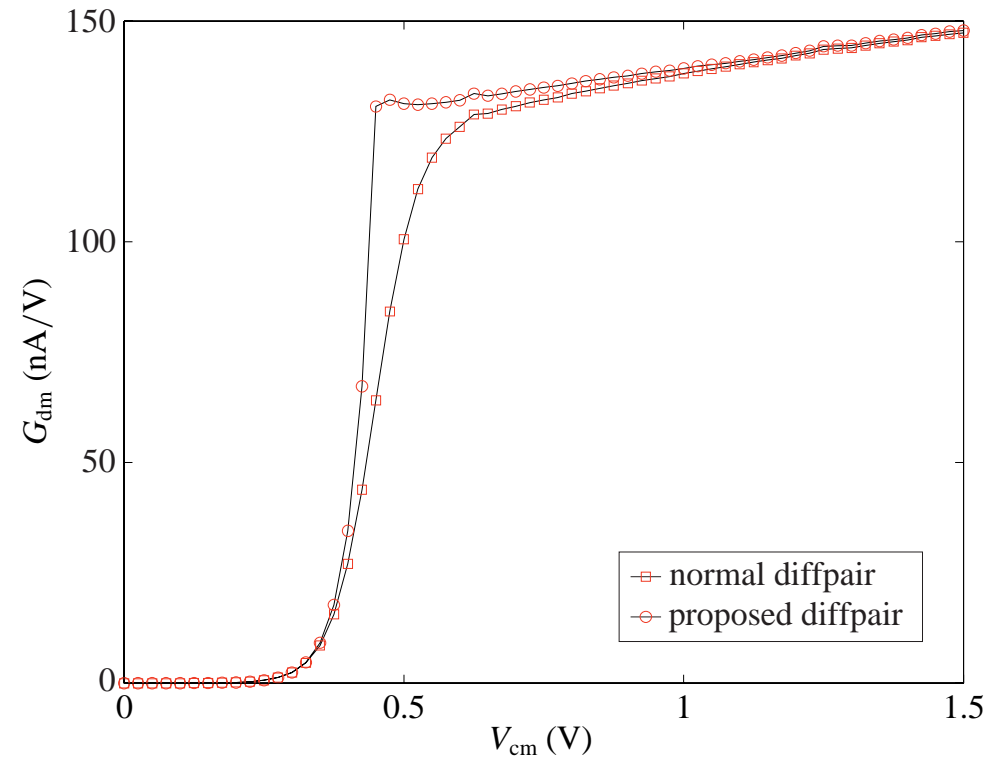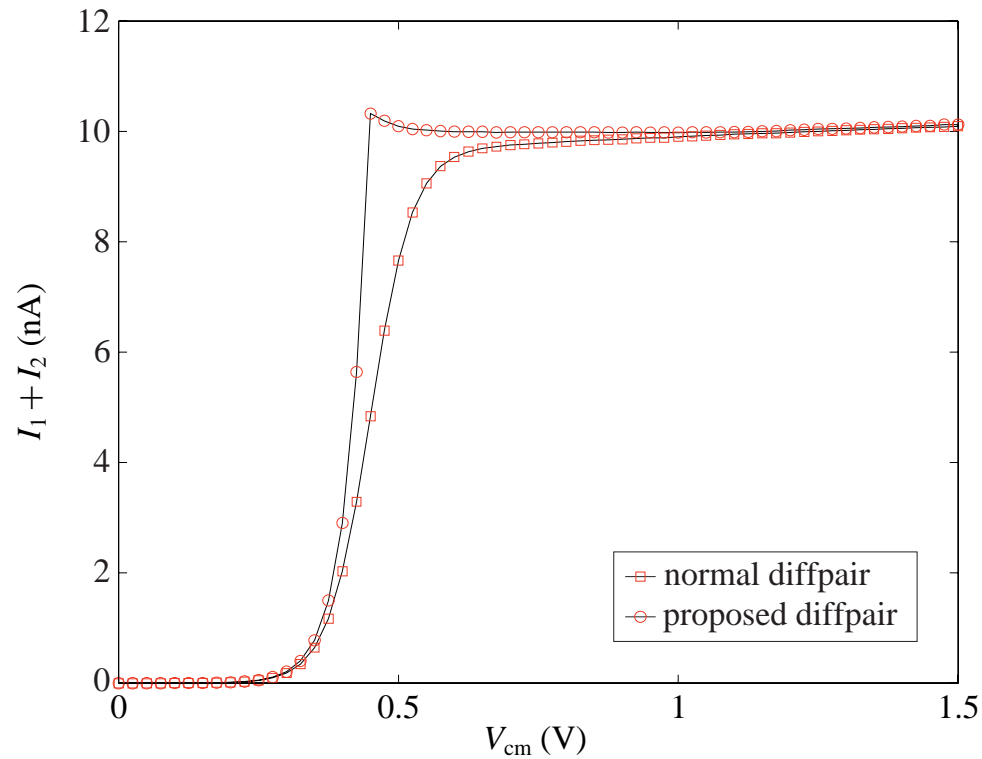
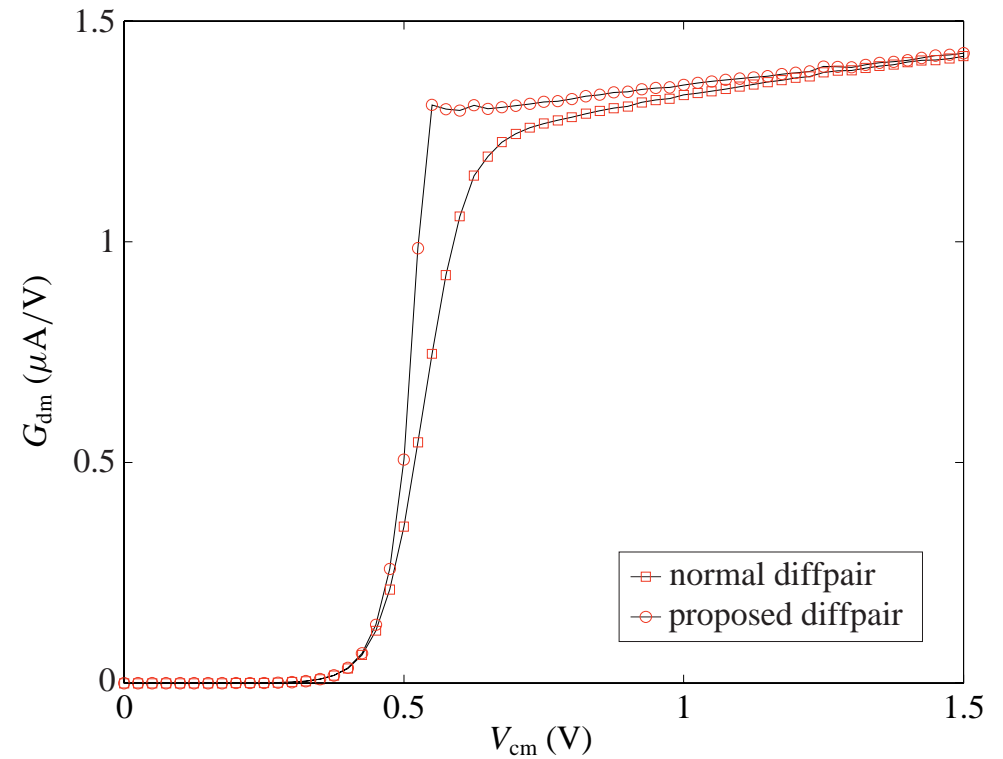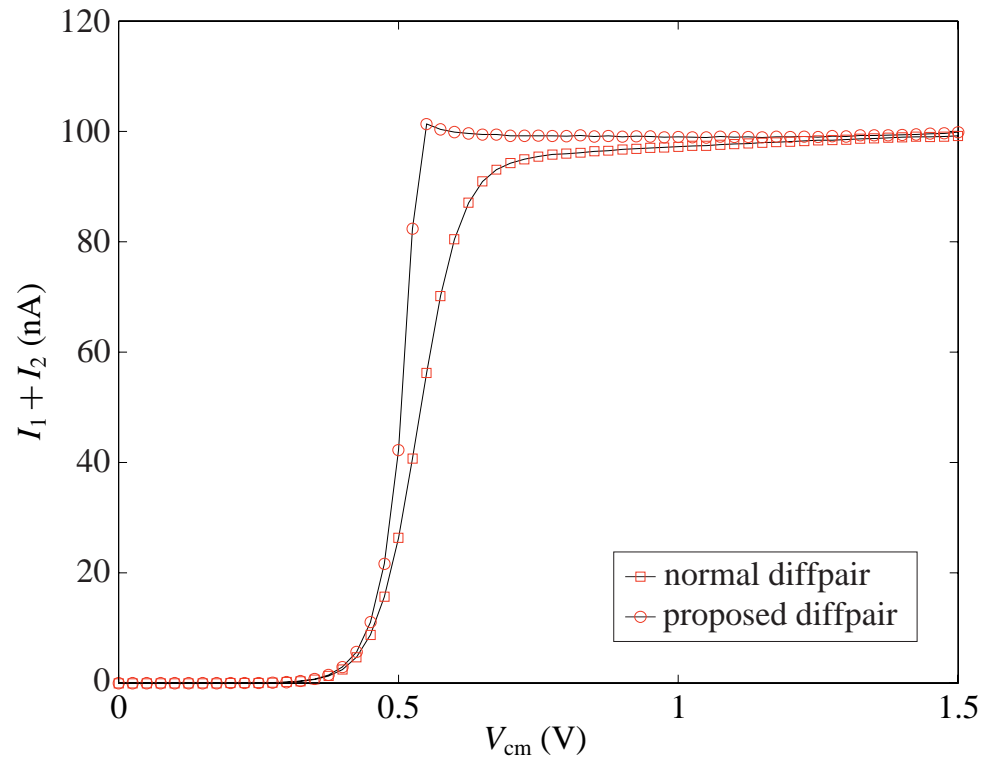# Experimental Common-Mode Characteristics

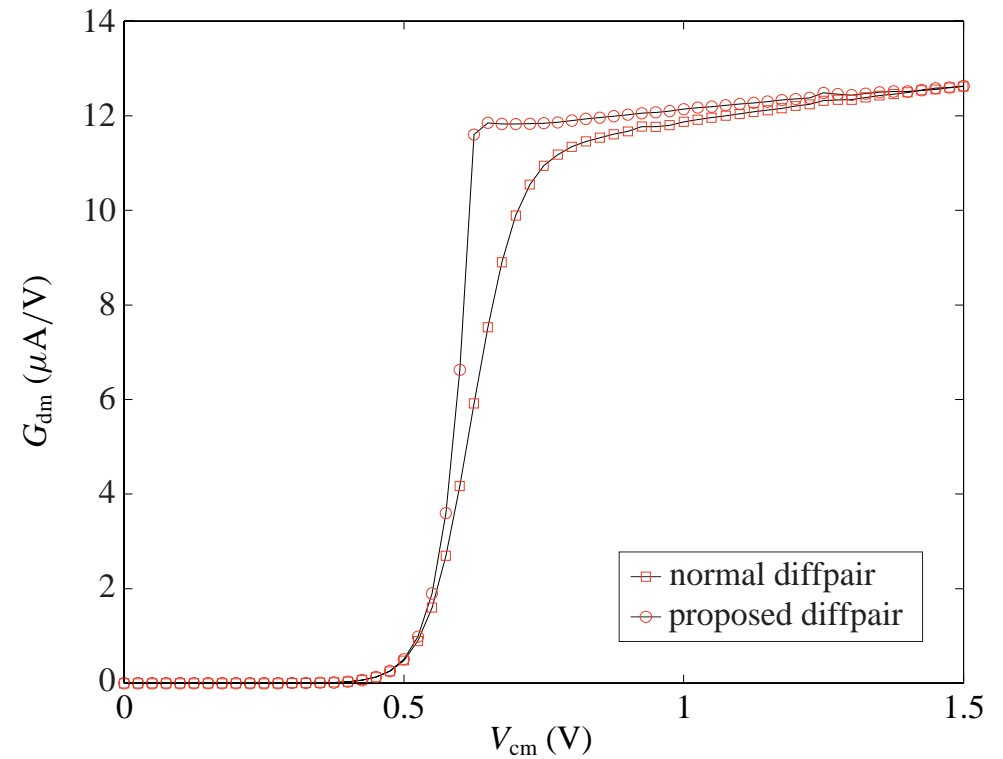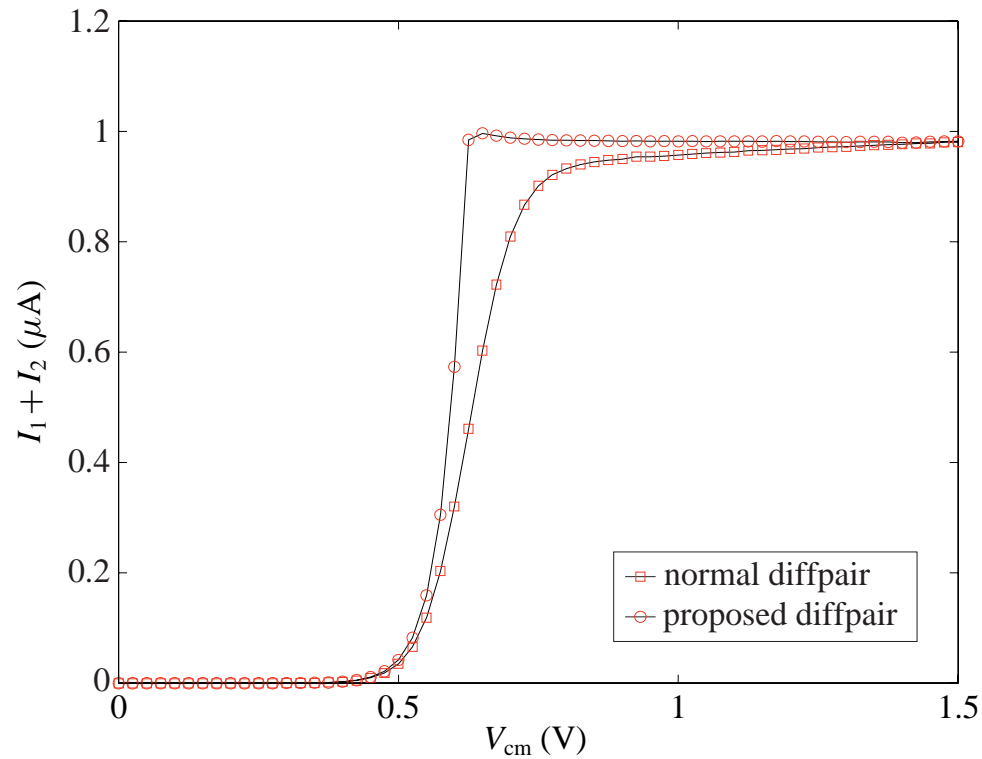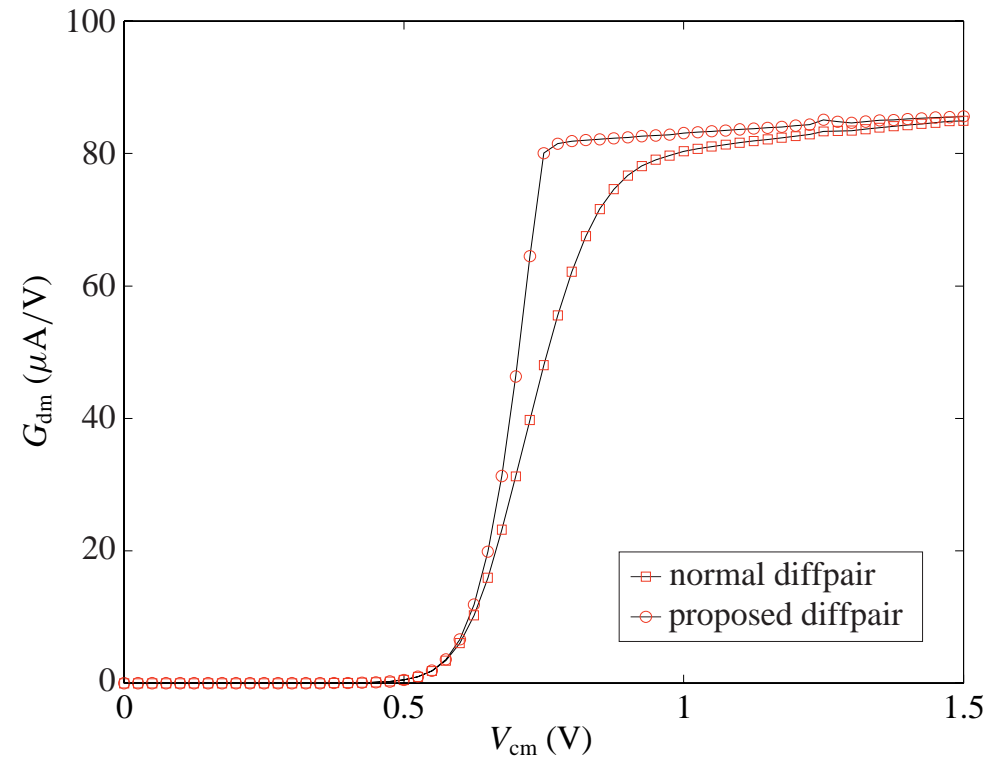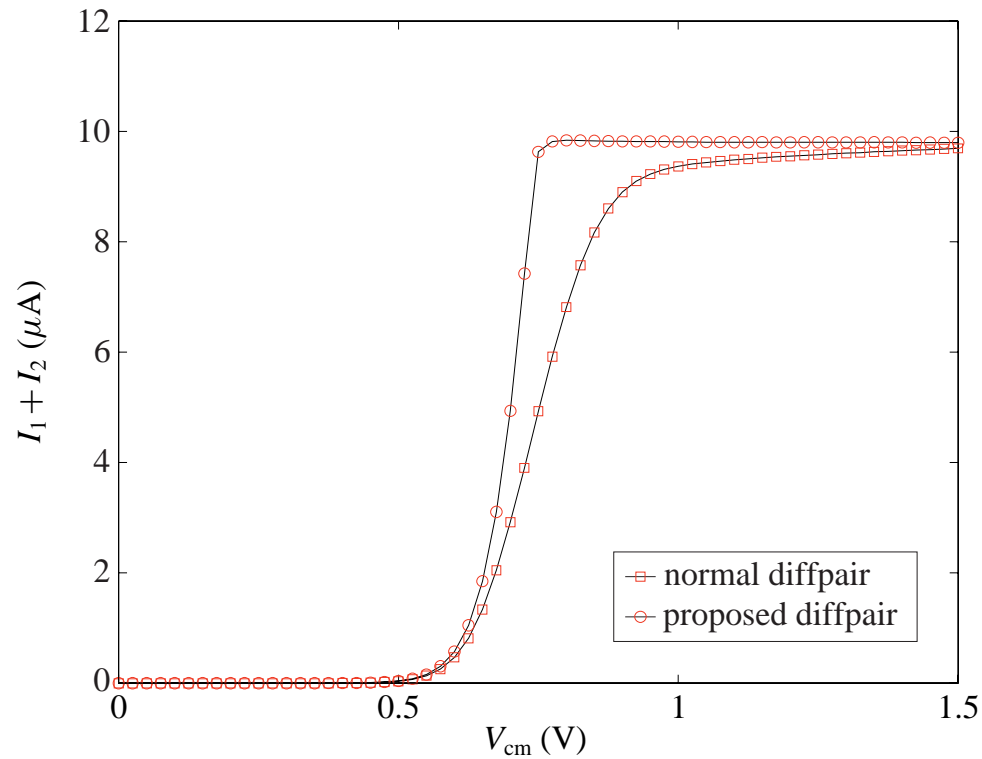# Experimental Common-Mode Characteristics: $I_b = 1.00\,\text{nA}$

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