

EE 240B – Spring 2018

Advanced Analog Integrated Circuits Lecture 15: Transimpedance Amplifier Design



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Review: Resistor “TIA”

Opamp-Based TIA

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Common-Gate TIA

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Common-Gate TIA Noise (1)

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Common-Gate TIA Noise (2)

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Common-Gate TIA SNR

Limitations of Common-Gate TIA

- **Input capacitance of the CG device limits achievable bandwidth:**

- **Achievable R_L (TIA “gain”) limited by voltage headroom and a_{v0}**
 - Increasing L often unattractive because of above consideration

Regulated Cascode (RGC) TIA

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RGC Phase Margin

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RGC Limitations

- **Make sure the entire “stack” can fit in the supply**
 - Gain boost stage usually the hardest to fit in
- **Watch out for linearity of CG device**
 - Intentionally amplifying its V_{GS}

Opamp TIA Revisited

OTA TIA Design (1)

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OTA TIA Design (2)

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OTA TIA Noise (1)

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OTA TIA Noise (2)

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OTA TIA Noise (3)

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OTA TIA SNR

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Inverter-Based TIA
