Prelab 3, Analog Integrated Circuits

Ole Jansen, Kaya Runge, Finn Rautenberg, 06.01.2023, Lübeck

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| 1) Simple Cascode1a) Circuit Diagram, schematic  Description automatically generated 1b) DC bias point simulation A picture containing text, device  Description automatically generated All FETs are in saturation due to and 1c) Calculation | 2) Wide-swing Cascode2a) CircuitDiagram, schematic  Description automatically generated2b) DC bias point simulation  |  |  | | --- | --- | | *A picture containing text, device, receipt  Description automatically generated* | A picture containing text, receipt  Description automatically generated |   All FETs are in saturation due to and , except M6 which is tuned to result in 2c) Calculation |



Figure : I\_D4 in relation to V\_D4 at DC Sweep (green: simple Cascode, red: wide-swing Cascode)

# 3) Comparison simple and wide-swing Cascode

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| Design |  |  |  |  |  | simulation | theory |
| Simple | 250 nm | 1 µm | - | 911 mV | 912 mV | 9,988 µA (@584 mV) | 584 mV |
| Wide-swing | 250 nm | 1 µm | 450 nm | 593 mV | 576 mV | 9,959 µA (@284 mV) | 284 mV |

The wide-swing Cascode is able to operate at 284 mV less then the simple Cascode at 584 mV, which is a 300mV improvement. If the saturation voltage = this difference should even increase. M6 has been modified to 450 nm, which is a none modulo 250 nm width, which is forbidden. The bias voltage is reached but M6 isn’t in saturation which may cause changes at other environmental parameters.