

Module: Telescopic Cascode Operational Amplifier

Module: Folded Cascode Operational Amplifier

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Module Description: Folded Cascode Operational Amplifier utilizes the cascode topology both on the pull down and pull up while using a current sink to fold the input transistors. It achieves high gain and medium output swing with a variability over the input common mode, while sacrificing the speed.

Top Cell Name: AMP_FOLDCASCODE65_v1

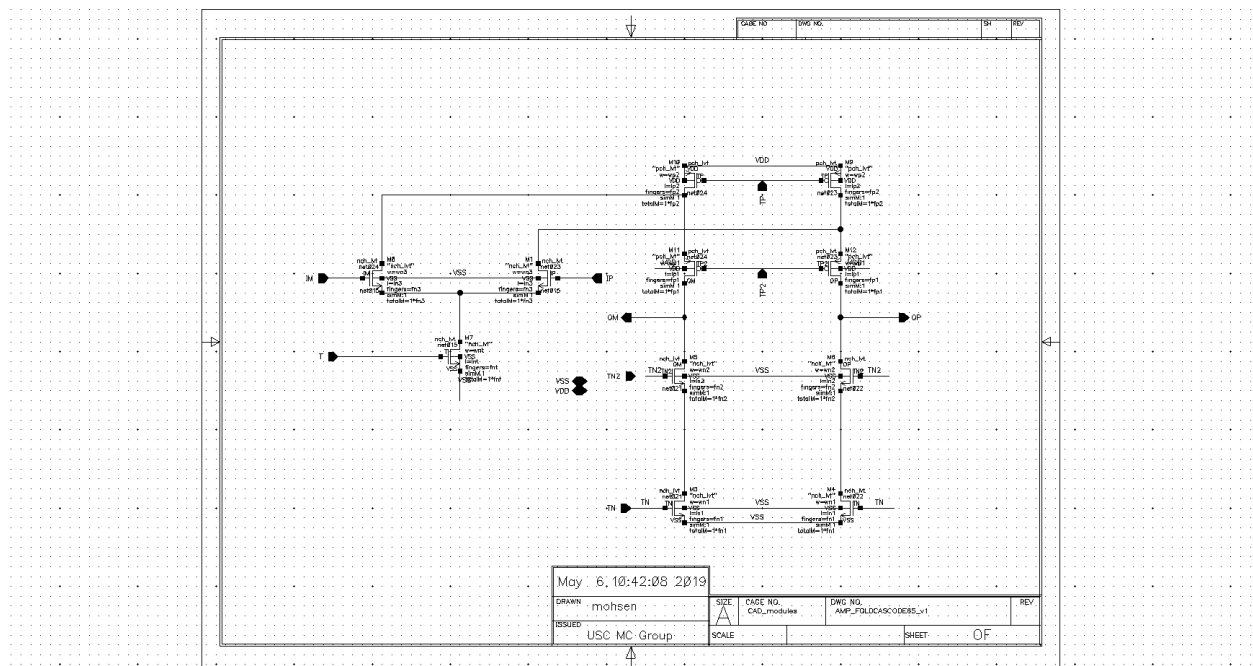
Technology: TSMC 65nm CMOS

PINS:

Pin Lists	
VDD	Supply Voltage
VSS	Ground
TP, TP2, TN2, TN, T	Bias voltages
IM, IP	Input Differential Voltage
OM, OP	Output Differential Voltage

Schematic Netlists: AFC_v1.scs

Schematic figures:



Testbenches: AFC_test.scs

Parameters:

Parameters	Symbols
Top PMOS # of Fingers	<i>fp2</i>
Top PMOS Length (m)	<i>lp2</i>
Mid PMOS # of Fingers	<i>fp1</i>
Mid PMOS Length (m)	<i>lp1</i>
Mid NMOS # of Fingers	<i>fn2</i>
Mid NMOS Length (m)	<i>ln2</i>
Bot NMOS # of Fingers	<i>fn1</i>
Bot NMOS Length (m)	<i>ln1</i>
Input NMOS # of Fingers	<i>fn3</i>
Input NMOS Length (m)	<i>ln3</i>
Sink NMOS # of Fingers	<i>fnt</i>
Sink NMOS Length (m)	<i>lnt</i>
Sink NMOS Bias (V)	<i>vttt</i>
Common Mode Voltage Input (V)	<i>vcmin</i>
Common Mode Voltage Output (V)	<i>vcmo</i>
Bot NMOS Bias (V)	<i>vtn1</i>
Mid NMOS Bias (V)	<i>vtn2</i>
Mid PMOS Bias (V)	<i>vtp2</i>
Output Capacitive Load (F)	<i>cl</i>

Metrics:

Metrics	Symbols
DC Power Consumption (W)	power
Output Swing Voltage (V)	swing
Common mode voltage gain (dB)	avcm
Differential gain (dB)	avd
Input Capacitance (F)	cin
Unity Gain Bandwidth (Hz)	gbw
Output Noise (V ² /Hz)	outnoise

Neural Network Model:

The H5 file: reg_AFC65.h5

The Json File: model_AFC65.json

The Input Normalization File: scX_AFC65.pkl

The Output Standardization File: scY_AFC65.pkl

The input characterization range of the Model:

Design parameters	
Symbols	Characterization Range
<i>fp2</i>	4,5, ..., 300
<i>lp2</i>	[60nm, 400nm]
<i>fp1</i>	4,5, ..., 300
<i>lp1</i>	[60nm, 400nm]
<i>fn3</i>	2,3, ..., 100
<i>ln3</i>	[60nm, 200nm]
<i>fn2</i>	2,3, ..., 100
<i>ln2</i>	[60nm, 200nm]
<i>fn1</i>	2,3, ..., 100
<i>ln1</i>	[60nm, 200nm]
<i>fnt</i>	4,5, ..., 200
<i>lnt</i>	[120nm, 400nm]
<i>vttt</i>	[0.3V, 0.6V]
<i>vcmin</i>	[0.6V, 1.0V]
<i>vcmo</i>	[0.8V, 1.2V]
<i>vtn1</i>	[0.4V, 0.6V]
<i>vtn2</i>	[0.6V, 0.95V]
<i>vtp2</i>	[0.0V, 0.2V]
<i>cl</i>	[1fF, 10pF]

The estimation error over the metrics:

