EC2.103: Analog Electronic Circuits

Dr. Zia Abbas

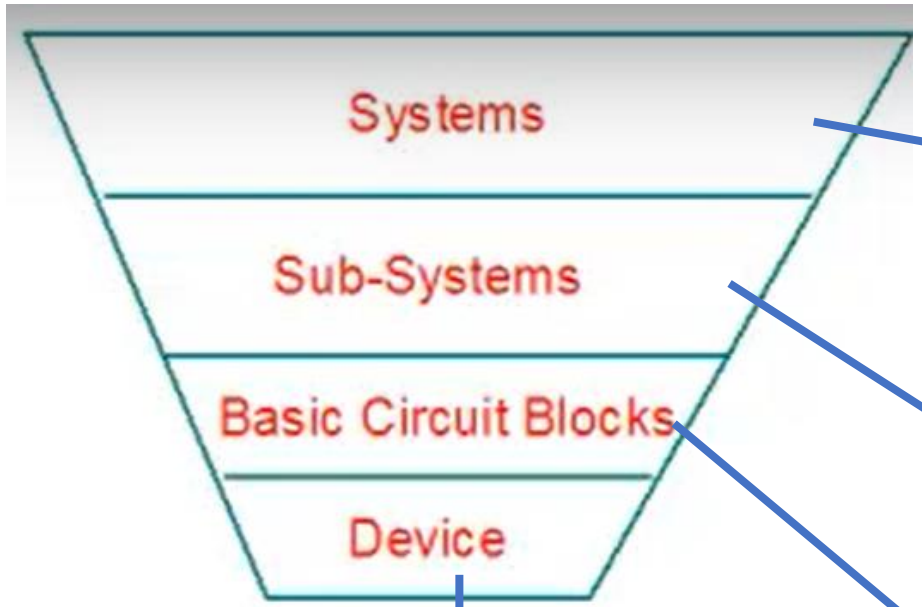
Centre for VLSI and Embedded System Technology (CVEST)

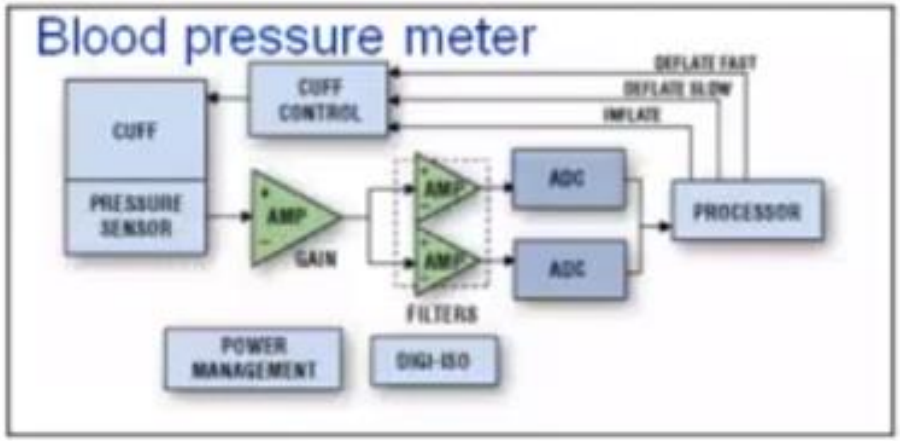
IIIT Hyderabad

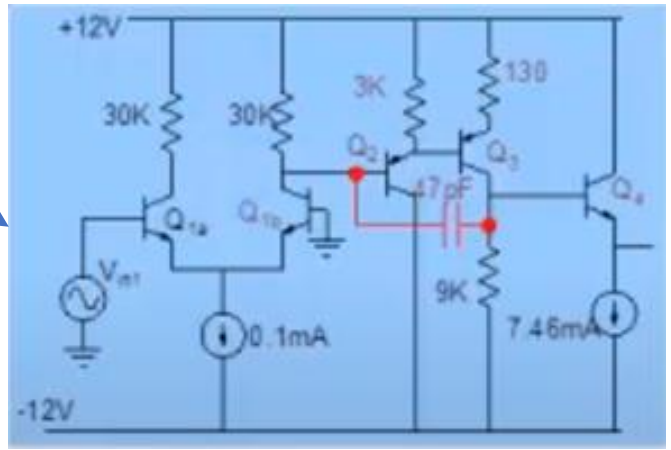
Books:

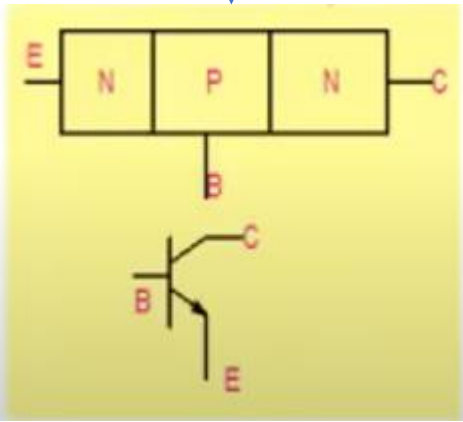
- Fundamentals of Microelectronics; Behzad Razavi
- Microelectronics Circuits; A. S. Sedra and K. C. Smith; Oxford University Press.
- Analysis and Design of Analog Integrated Circuits; P. R. Gray, P. J. Hurst, S. H. Lewis, and R. G. Meyer; John Wiley & Sons.
- CMOS Analog Circuit Design, P. E. Allen and D. R. Holberg, Oxford University Press.

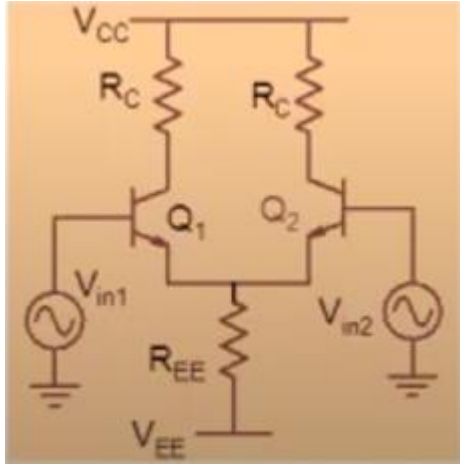
Microelectronics Pyramid



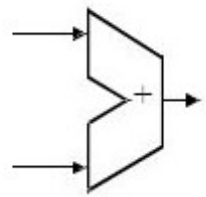




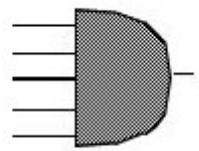




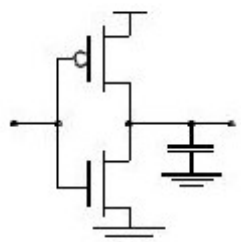
SYSTEM



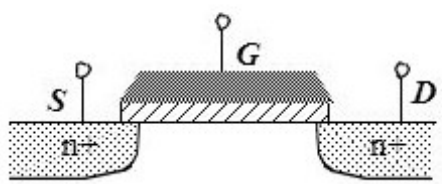
MODULE



GATE



CIRCUIT



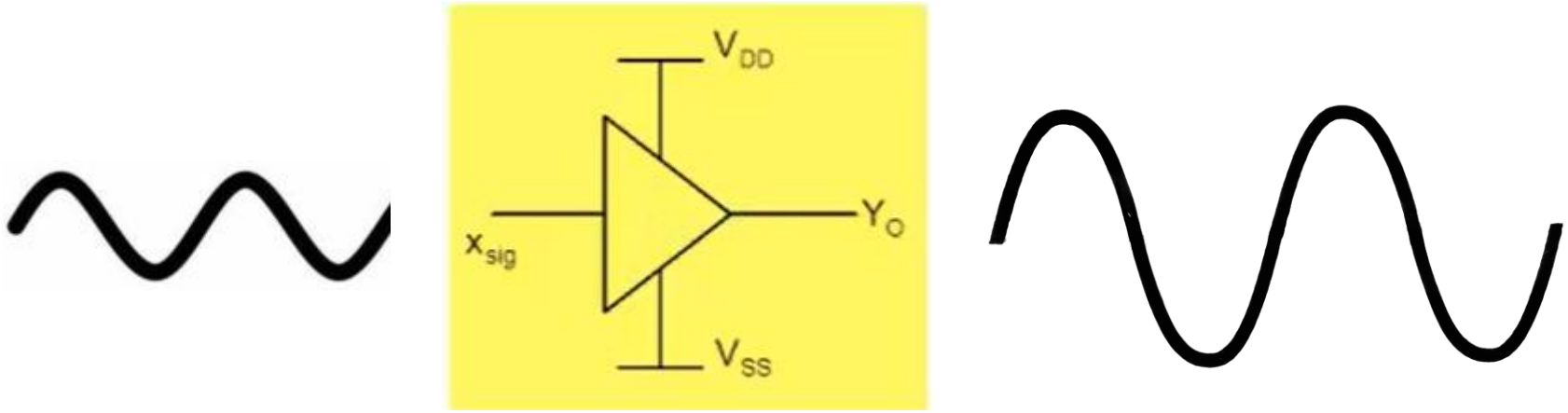
DEVICE

What is Microelectronics?

It is a field which deals with implementation of 'ideas' on a piece of semiconductor (e.g. Silicon)

Microelectronics is 'Writing in Sand'

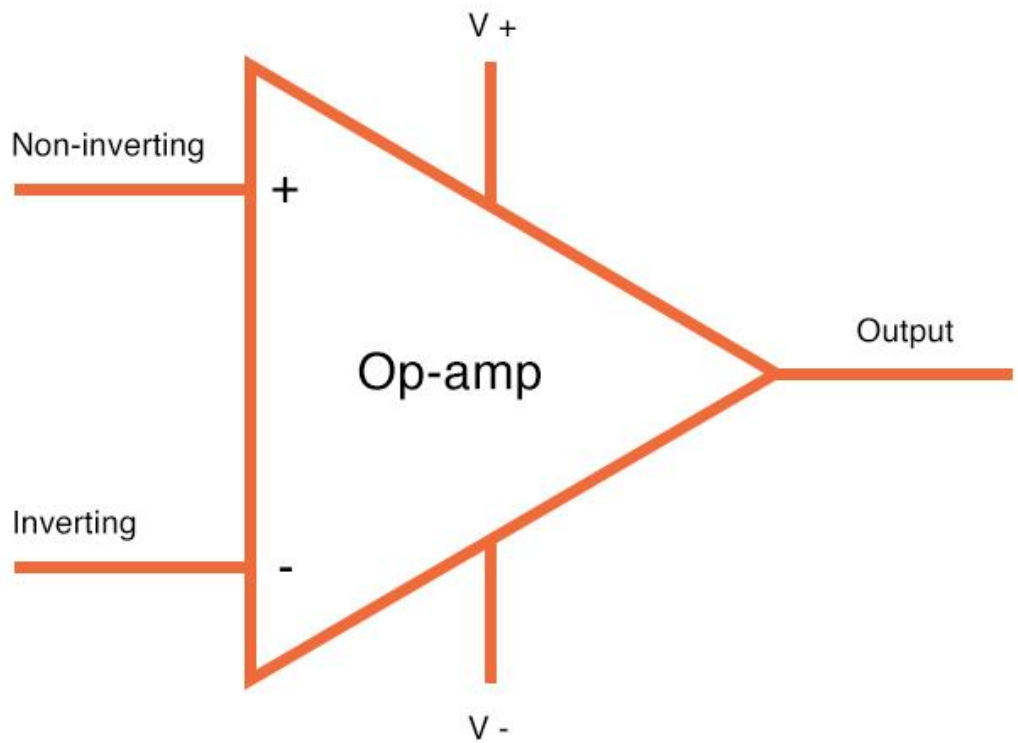
EC2.103 is also about discussing Amplifier

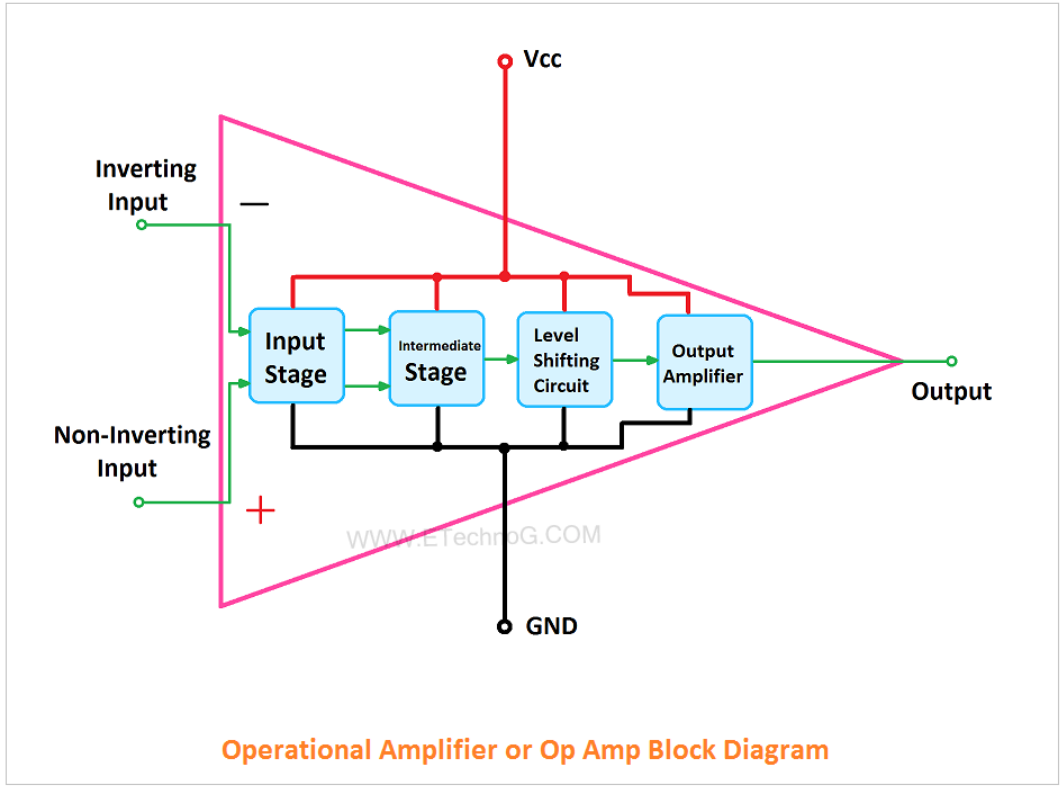


$$\frac{P_O}{P_{sig}} > 1$$

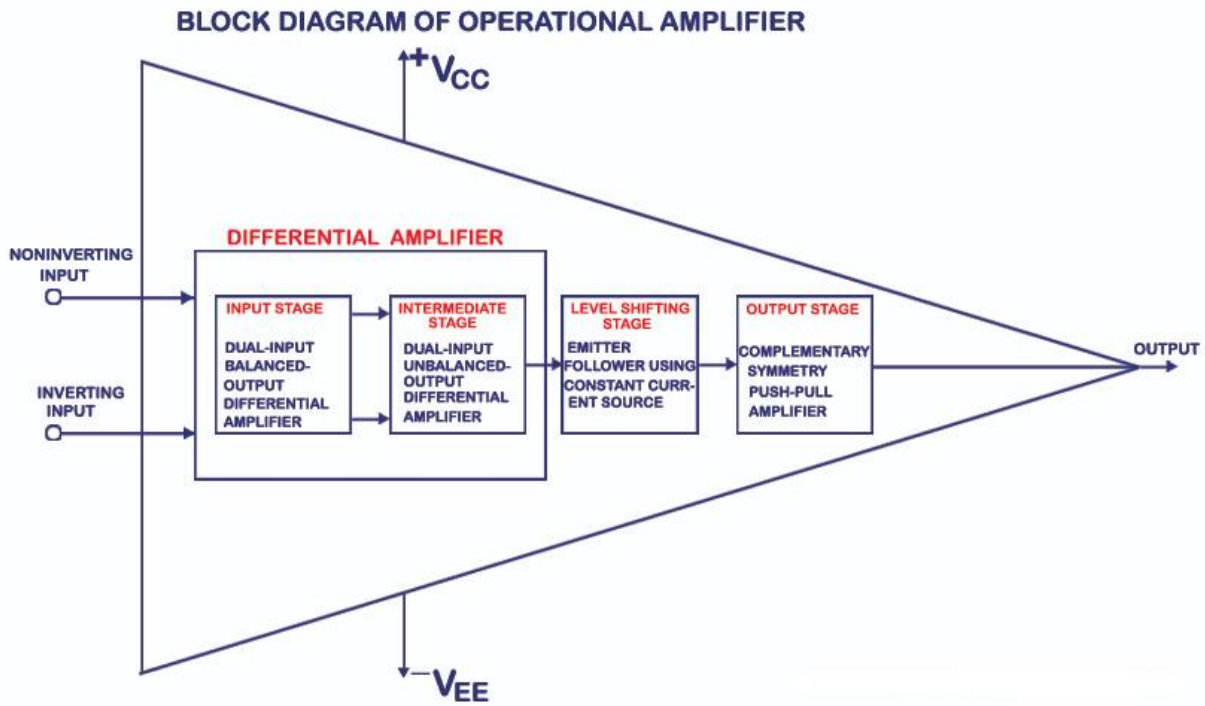
Amplifiers are the heartbeat of Electronics

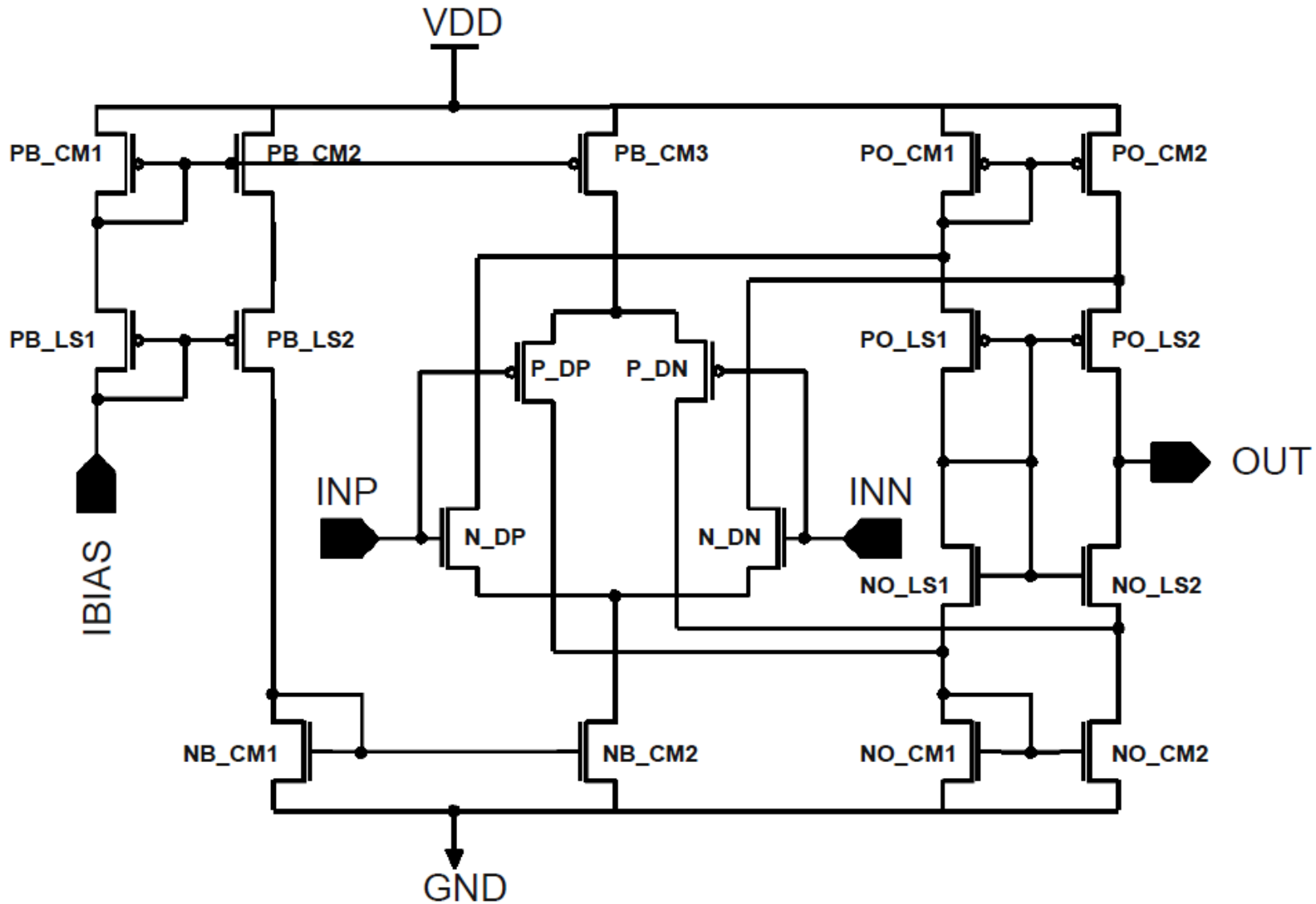
The foundation of civilization is “Amplification”

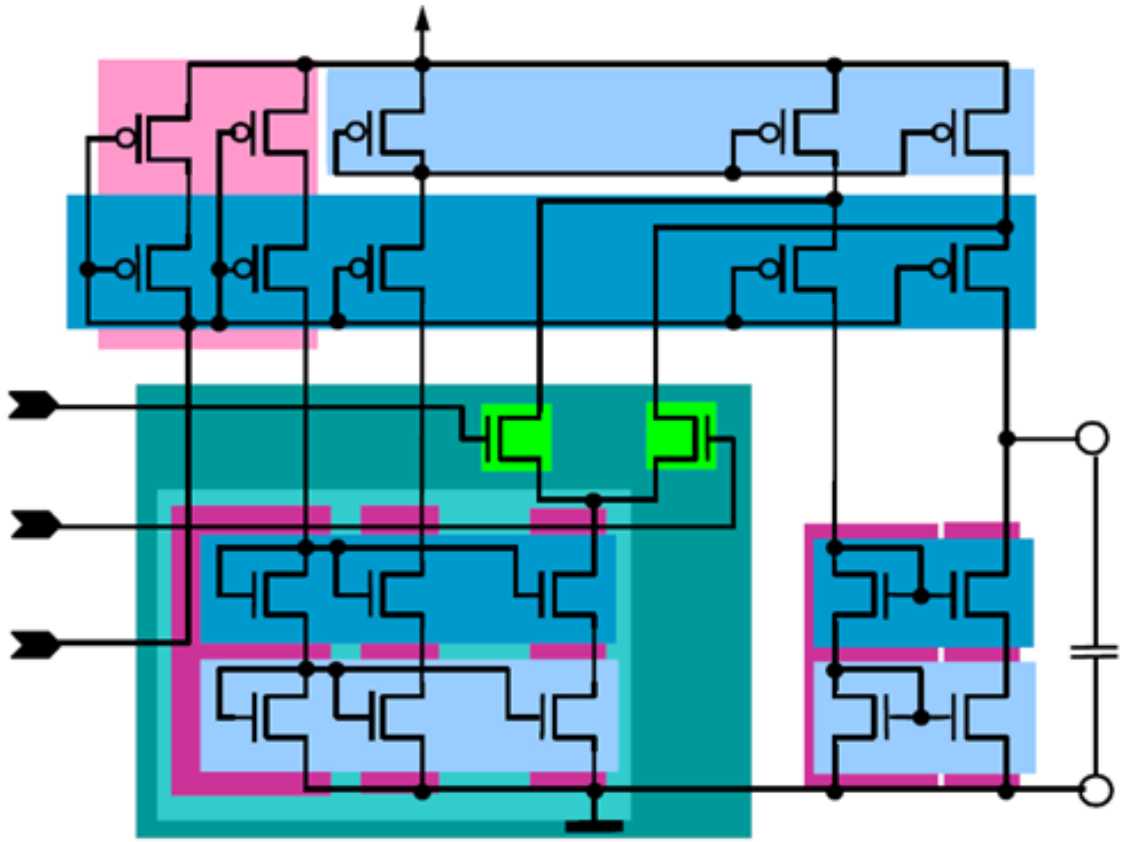

V +
Non-inverting
+
Output
Op-amp
Inverting
-
V -



Operational Amplifier or Op Amp Block Diagram




VDD
PB_CM1
PB_CM2
PB_CM3
PO_CM1
PO_CM2
PB_LS1
PB_LS2
P_DP
P_DN
PO_LS1
PO_LS2
OUT
INP
INN
IBIAS
N_DP
N_DN
NO_LS1
NO_LS2
NB_CM1
NB_CM2
NO_CM1
NO_CM2
GND



Automatically detected structures

- Current mirror
- Levelshifter
- Diff. pair

4-Transistor-Curr.mirr.

Current mirror bank

Levelshifter(-bank)

Cascode Curr.mirr.

Casc.Curr.mirr. bank

Differential stage