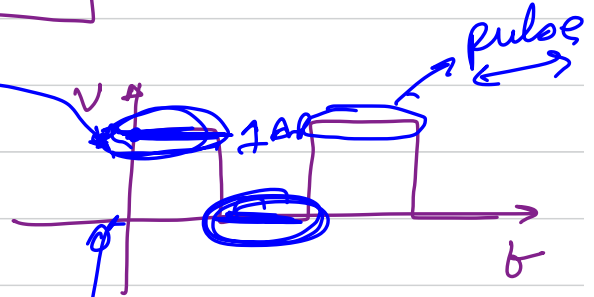
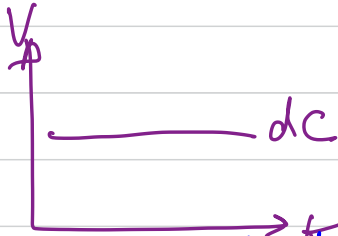
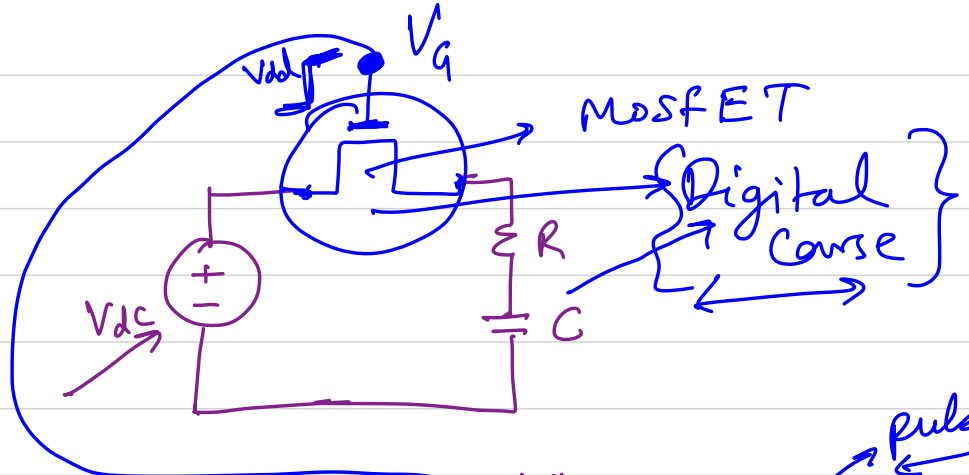
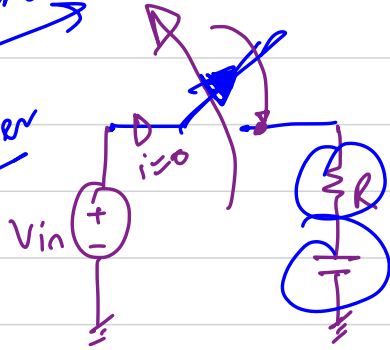
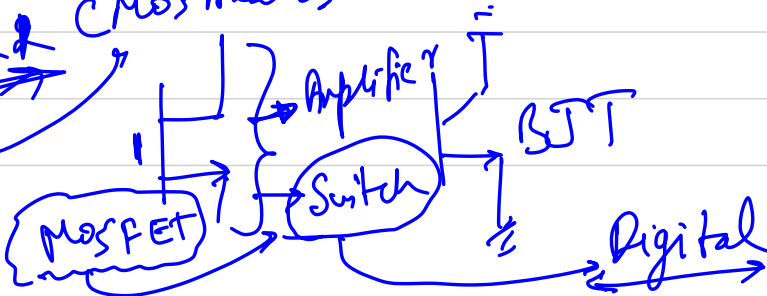


Second order
First order



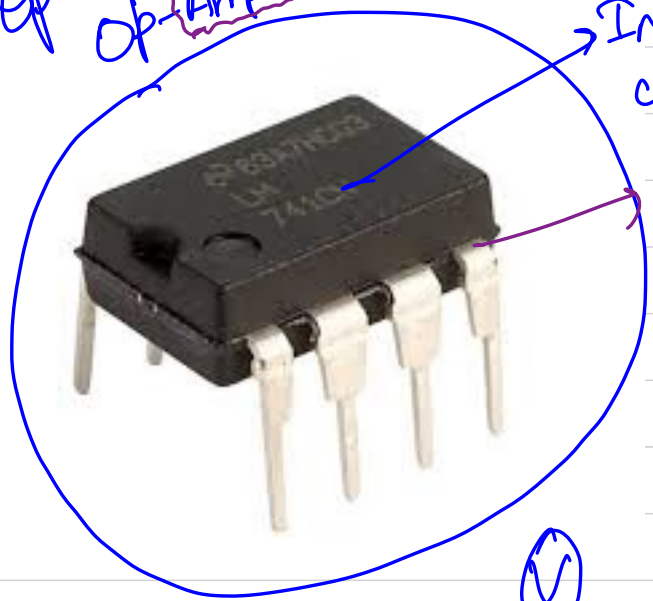
EL42 CMOS Amplifier



$t_1 -$
 $V_4 -$
 $t_2 -$
 $V_2 -$
 $t_3 -$
 $V_3 -$

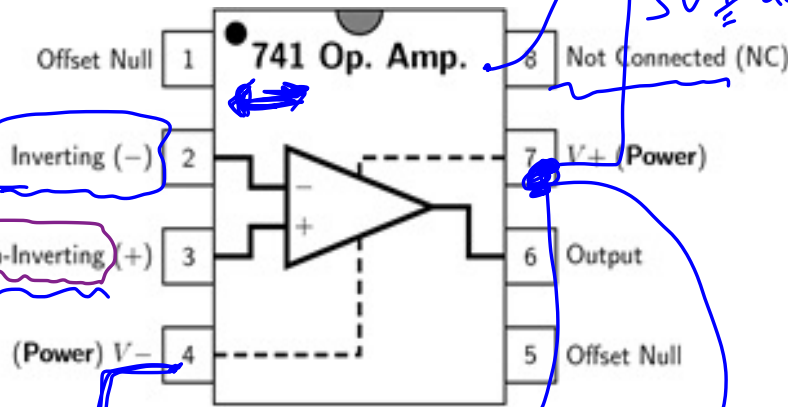
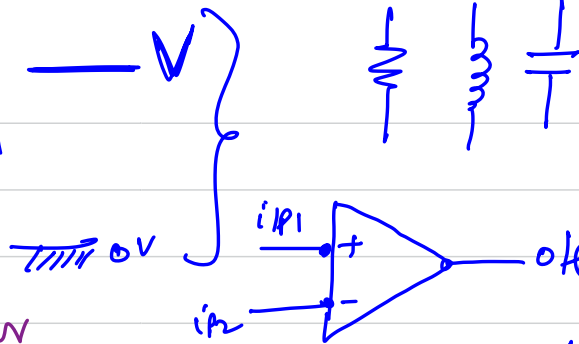
Operational Amplifiers

Op-Amps

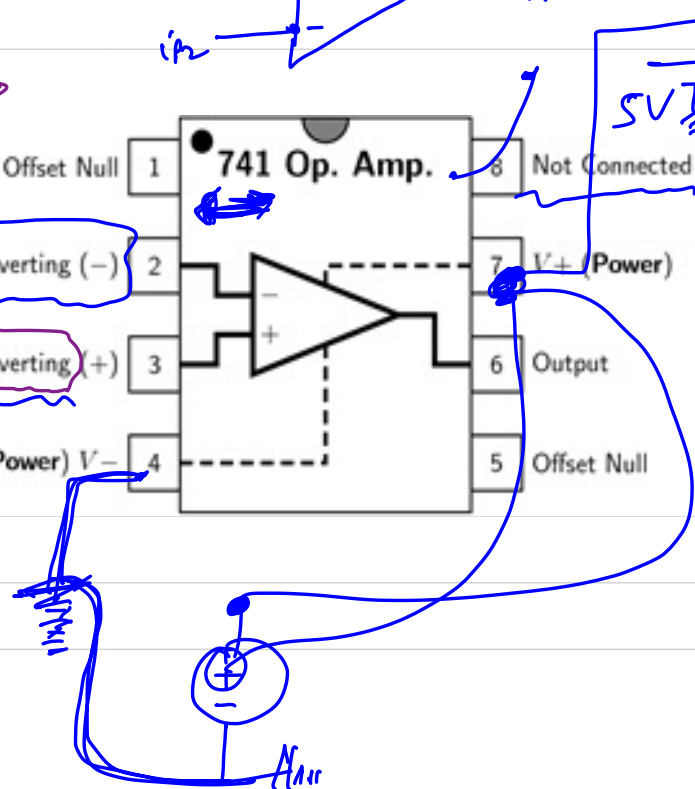
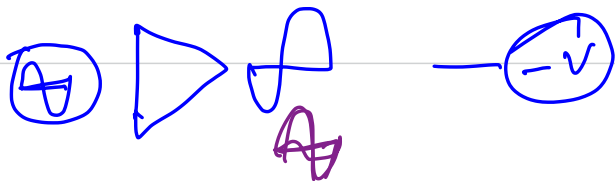


Integrated circuit

Amplifier

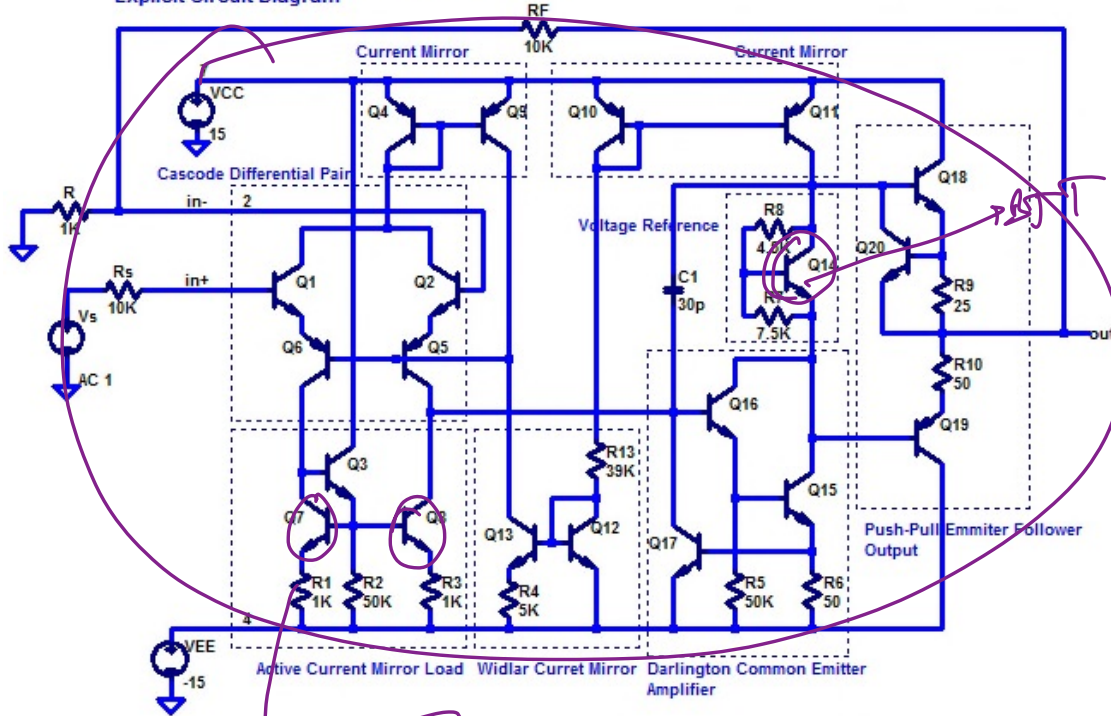


Triode \rightarrow BJT \rightarrow MOSFET

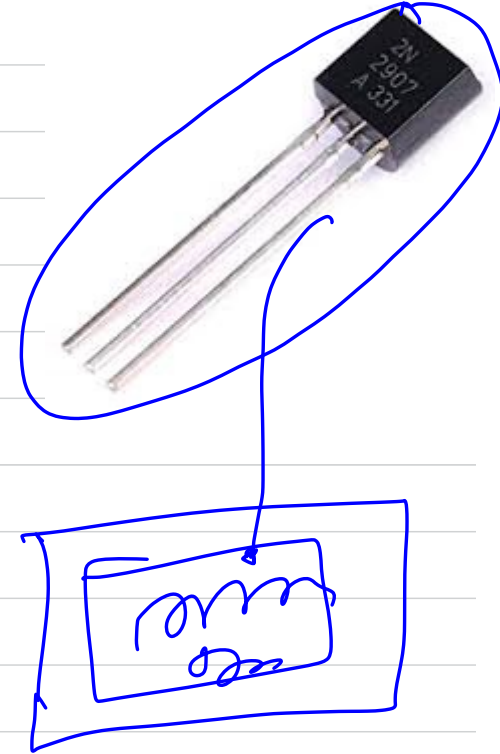


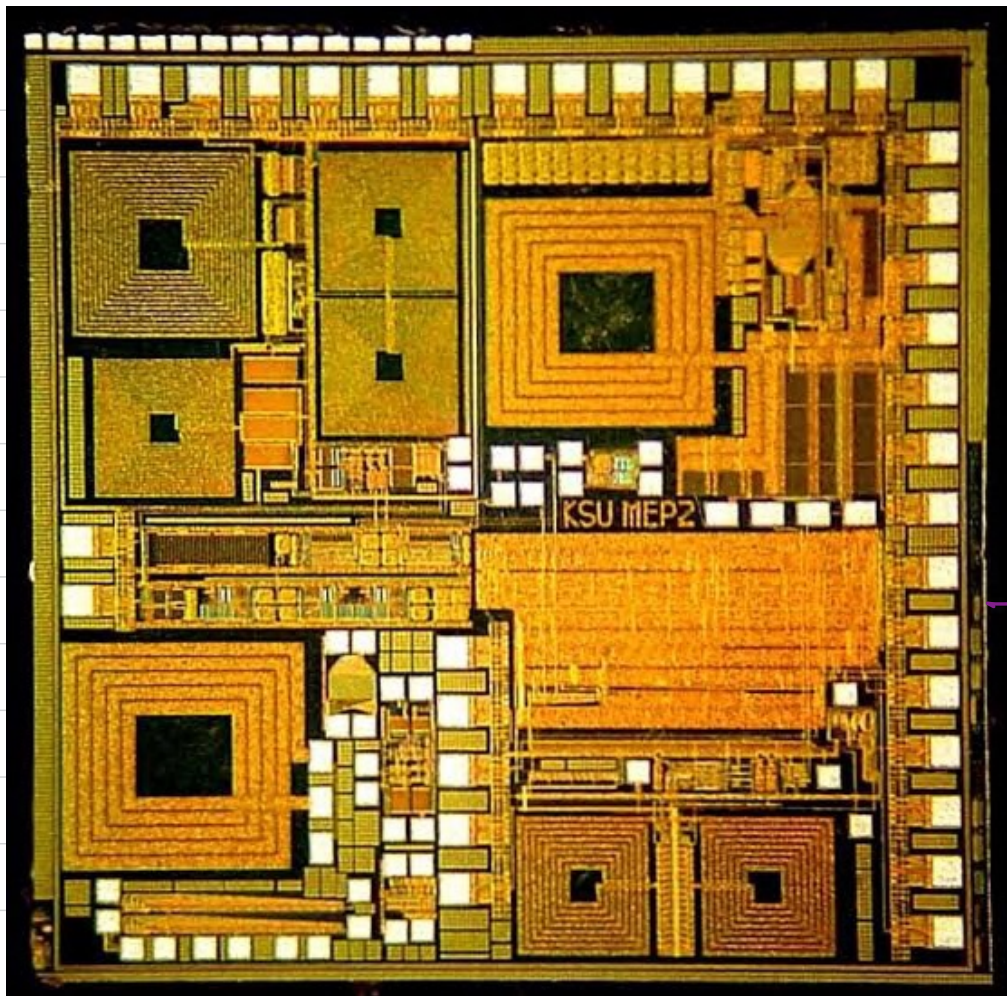
Integrated Circuits

LM 741 Op Amp in Non Inverting Configuration
Explicit Circuit Diagram



(MOS) \rightarrow BJT \rightarrow opamp

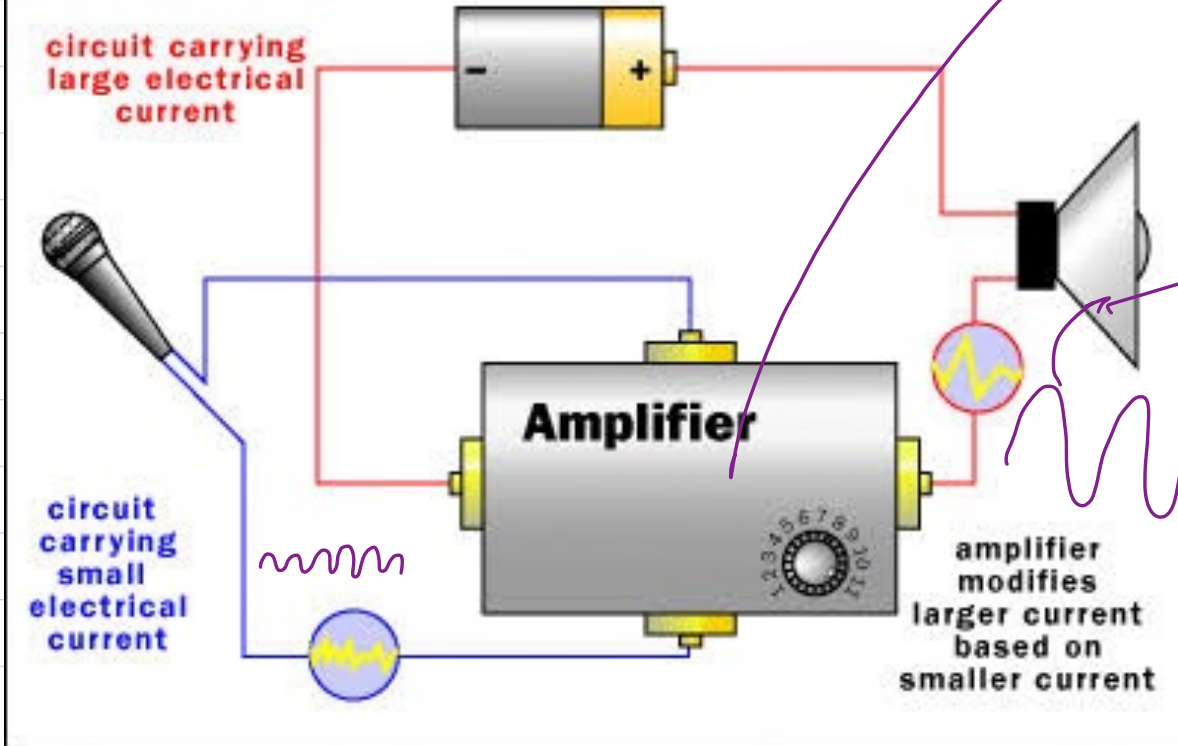




Integrated
chip

RF IC

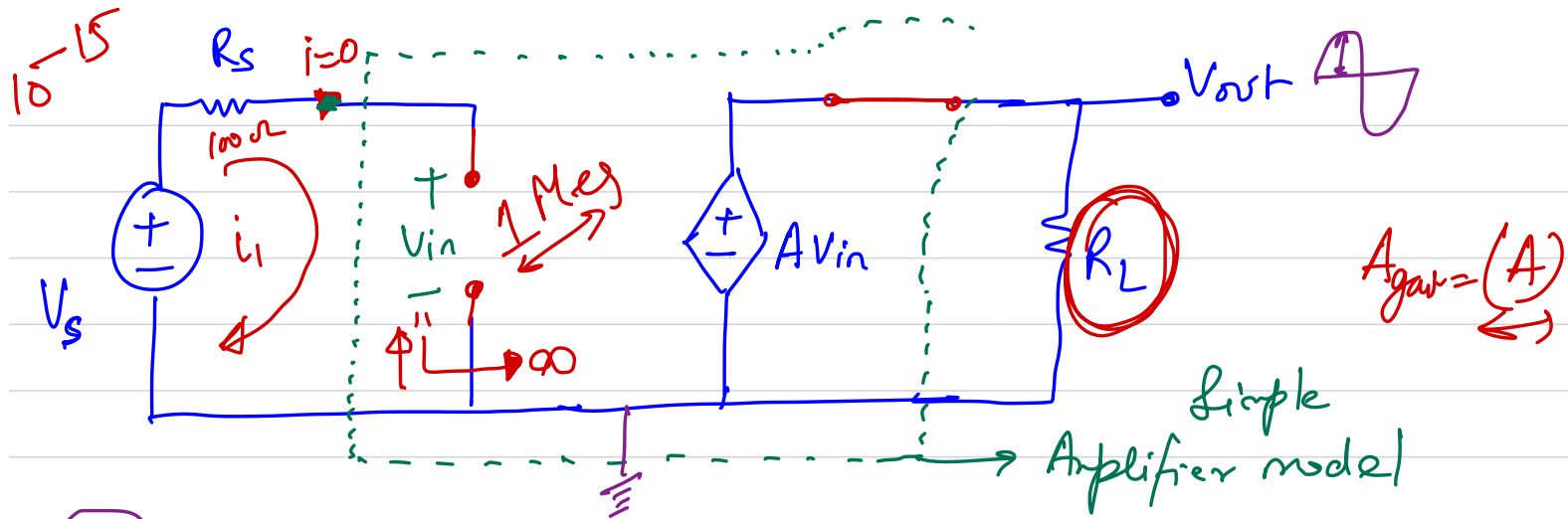
How Amplifiers Work



input

output

3331



Gain =
 of the amplifier

$$\frac{V_{out}}{V_s}$$

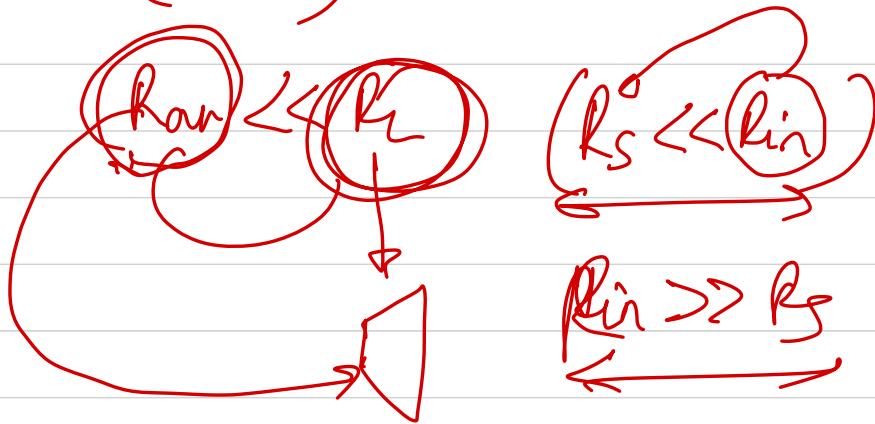
$$V_{out} = \frac{R_L}{R_L + R_{out}} (A V_{in})$$

$$V_{in} = \frac{R_{in}}{(R_{in} + R_s)} V_s$$

$$G_L = \frac{V_{out}}{V_s} = A \frac{R_L}{(R_L + R_{out})} \frac{R_{in}}{(R_{in} + R_s)}$$

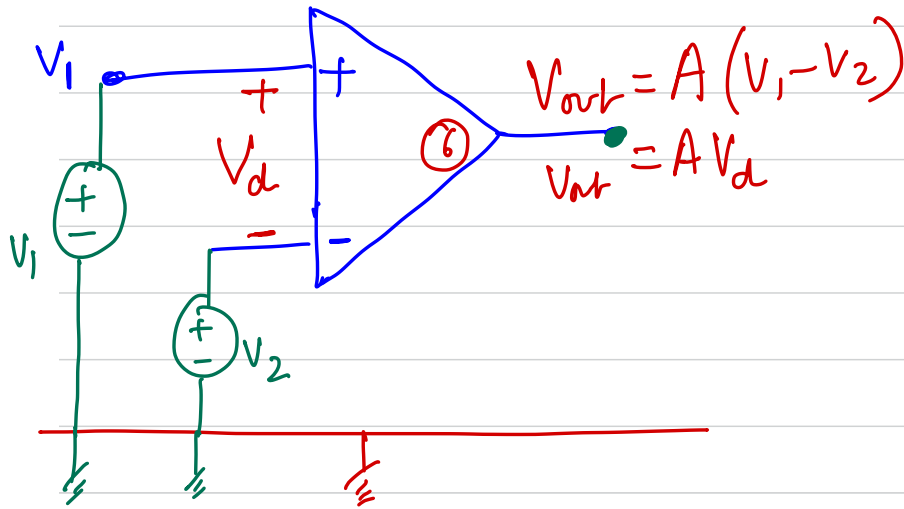
Gain \neq

$$A \frac{(R_L)}{(R_L + R_{av})} \frac{(R_{in})}{(R_{in} + R_s)} = \textcircled{A} \quad \textcircled{A}$$



$$R_{av} = 0$$

$$R_{in} = \infty$$



$$V_{1g} \quad V_{2g}$$

$$V_d = V_{1g} - V_{2g}$$

$$V_d = (V_{12})$$

$$(V_d) = V_1 - V_2$$

