LINEAR INTEGRATED CIRCUITS

Ideal Op-Amp,
Practical OpAmp,
Equivalent Circuit &
Transfer Curves of OpAmps

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Ideal OpAmp Parameters

Open Loop Voltage Gain

$$A_d = \frac{V_o}{V_{id}} = \frac{V_o}{V_+ - V_-} = \infty$$

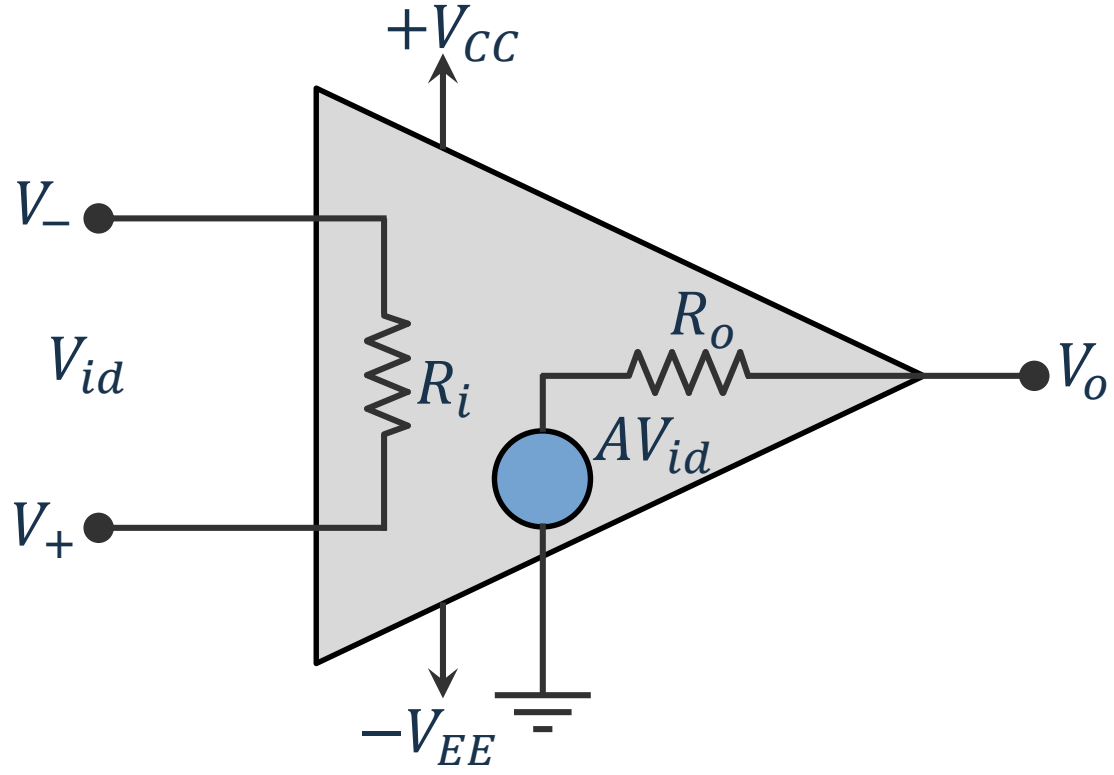
Input Resistance $R_i = \infty$

Output Resistance $R_o = 0$

Bandwidth $BW = \infty$

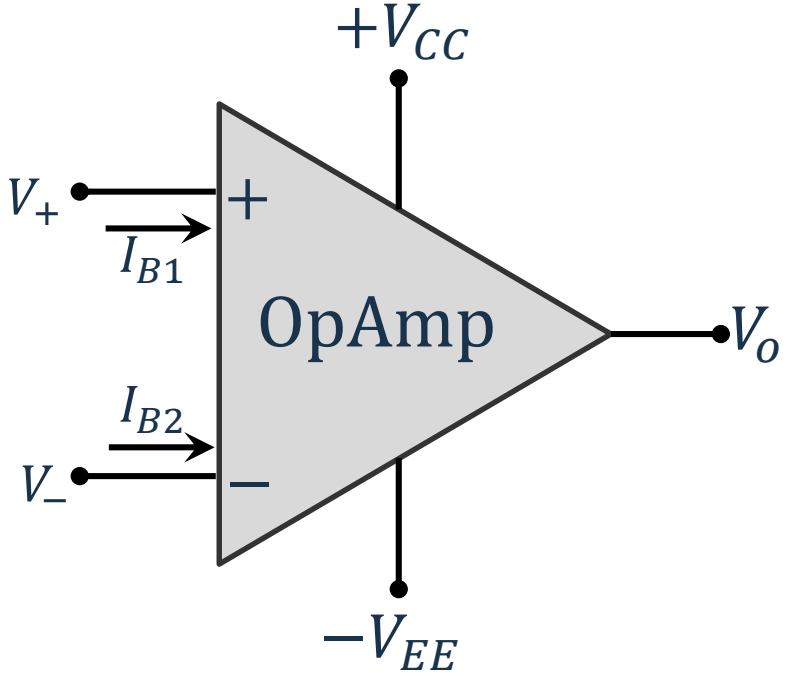
Input Offset Voltage $V_{io} = 0$

Common Mode Rejection Ratio $CMRR = \infty$



Ideal Vs Practical OpAmp IC741

S. No.	Parameters	Ideal	Practical
1.	Open Loop Voltage Gain $A_d = \frac{V_o}{V_+ - V_-}$	∞	$100dB$
2.	Input Resistance R_i	∞	$2M\Omega$
3.	Output Resistance R_o	0	75Ω
4.	Bandwidth BW	∞	$1MHz$
5.	Input Offset Voltage V_{io}	0	$6mV$
6.	Input Offset Current $I_{io} = I_{B1} - I_{B2}$	0	$200nA$
7.	Input Bias Current $I_B = \frac{I_{B1}+I_{B2}}{2}$	0	$500nA$
8.	Slew Rate $\frac{dV_o}{dt}$	∞	$0.5V/\mu Sec$
9.	CMRR $\frac{A_d}{A_{cm}}$	∞	$80dB$
10.	PSRR or SVRR $\frac{\Delta V_{io}}{\Delta V}$	0	$150\mu V/V$



Equivalent Circuit Diagram

Differential Input Voltage

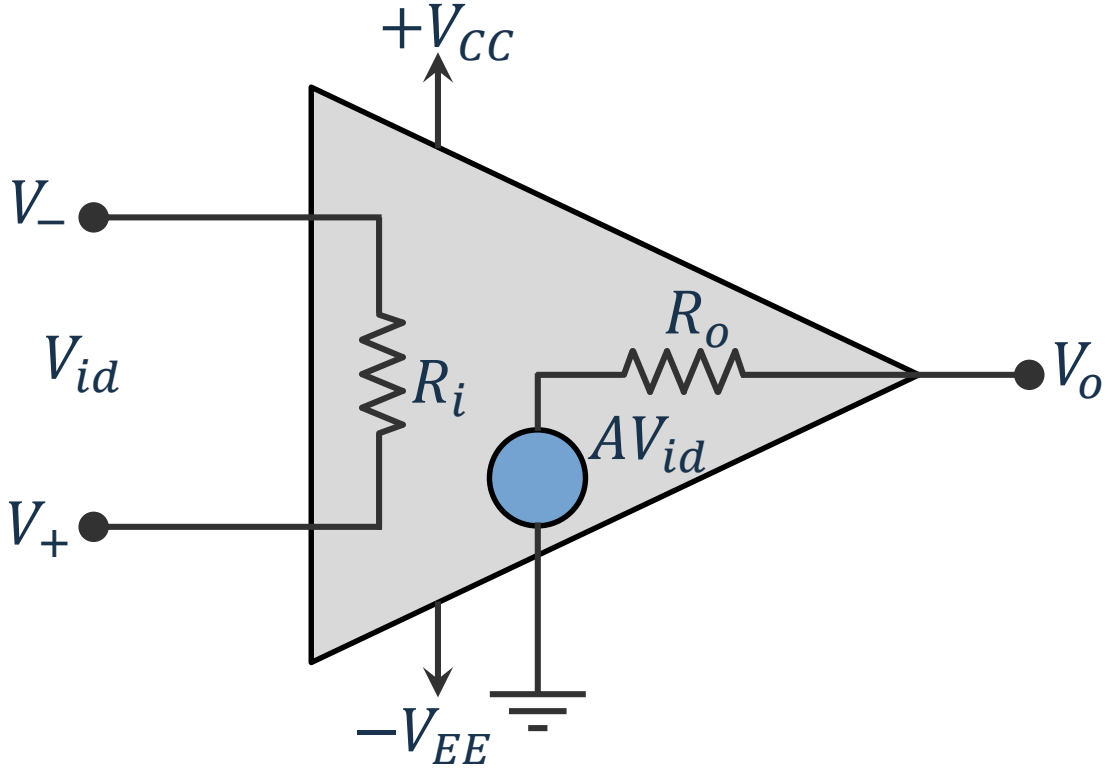
$V_{id} = V_+ - V_-$

Voltage Gain, $A = \frac{V_o}{V_{id}} \approx \infty$

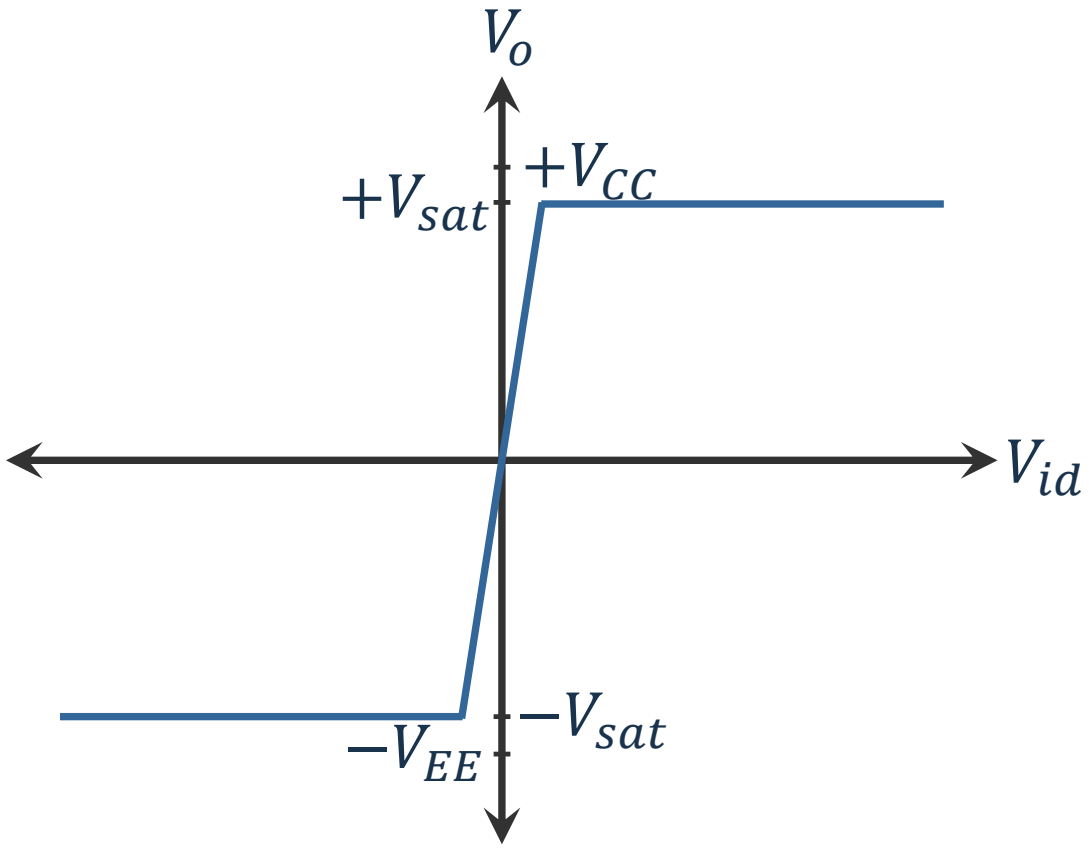
$V_{id} = \frac{V_o}{A} = 0 \leftrightarrow V_+ = V_-$

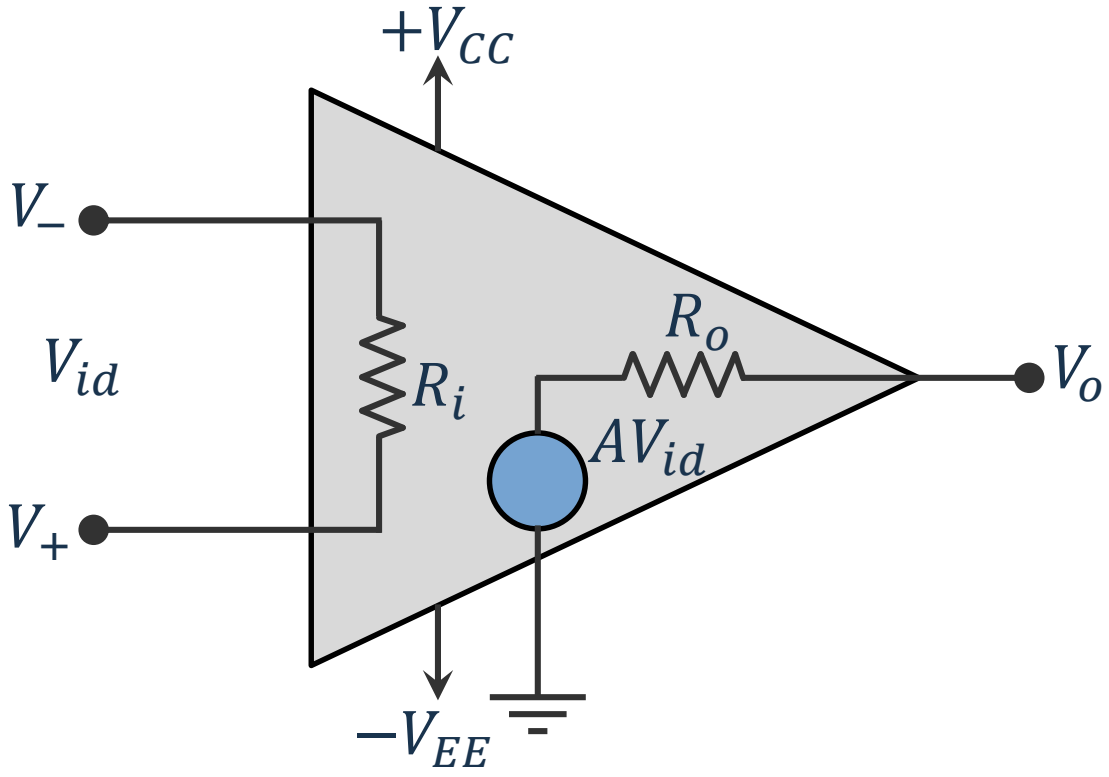
This is call **Virtual Short Circuit**

Ideally, $R_o = 0\Omega$ and $R_i = \infty$



Transfer Curve





THANK YOU

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