

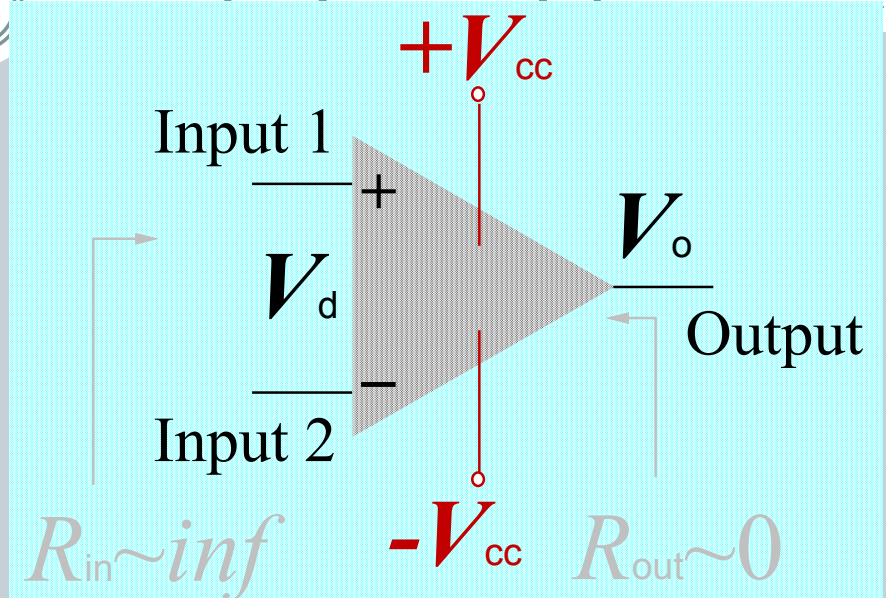
Op-Amp

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- Introduction of Operation Amplifier (Op-Amp)
- Analysis of ideal Op-Amp applications
- Comparison of ideal and non-ideal Op-Amp
- Non-ideal Op-Amp consideration

Operational Amplifier (Op-Amp)

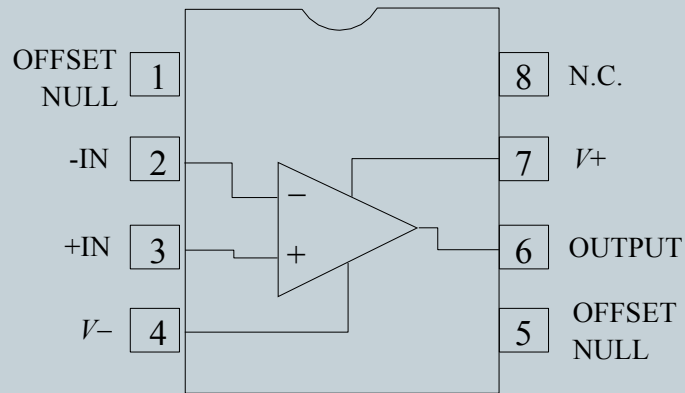
- Very high differential gain
- High input impedance
- Low output impedance
- Provide voltage changes (amplitude and polarity)
- Used in oscillator, filter and instrumentation
- Accumulate a very high gain by multiple stages



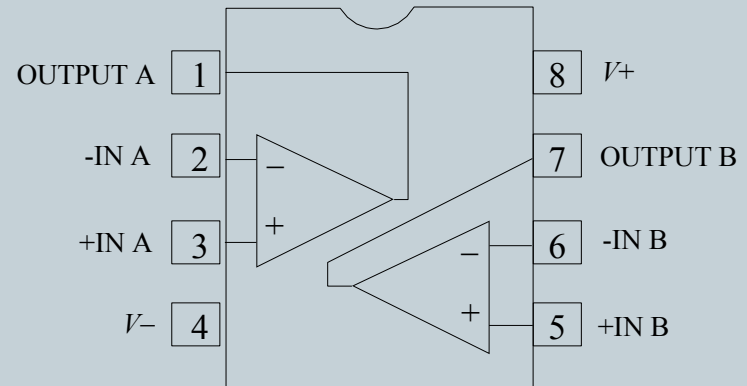
$$V_o = G_d V_d$$

G_d : differential gain normally very large, say 10^5

IC Product



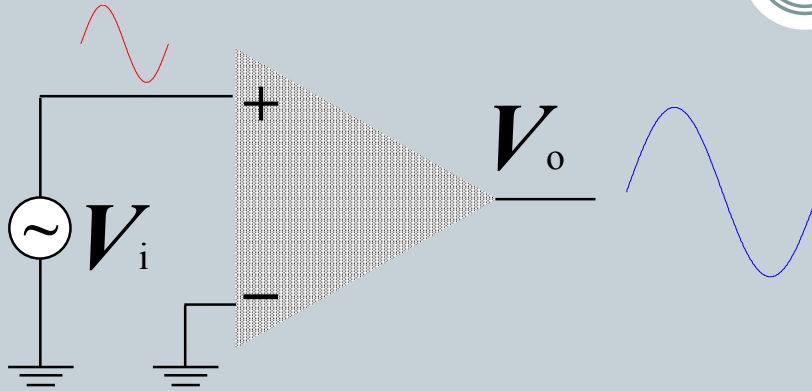
DIP-741



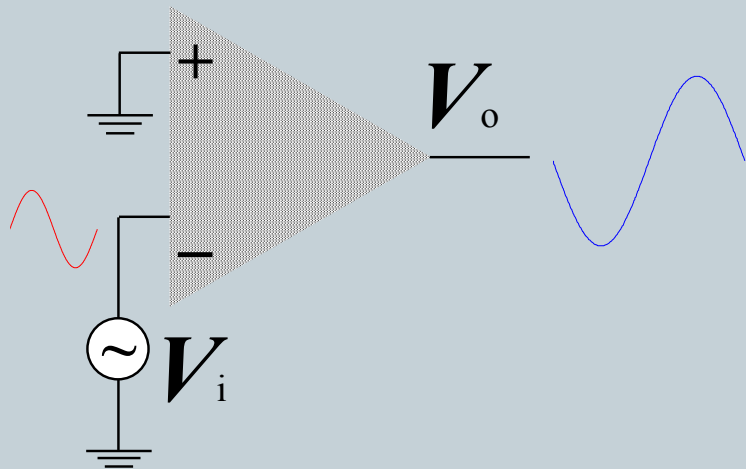
Dual op-amp 1458 device

Single-Ended Input

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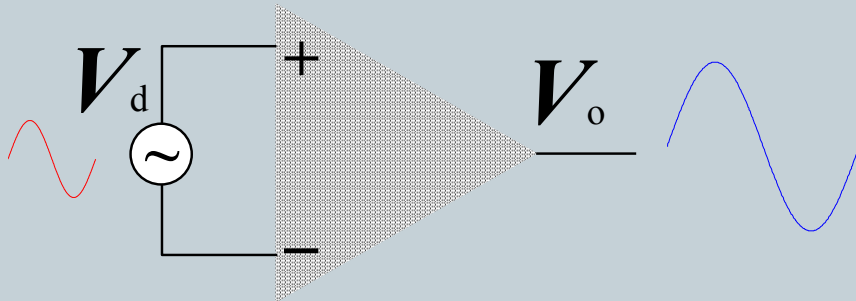
- + terminal : Source
- - terminal : Ground
- 0° phase change



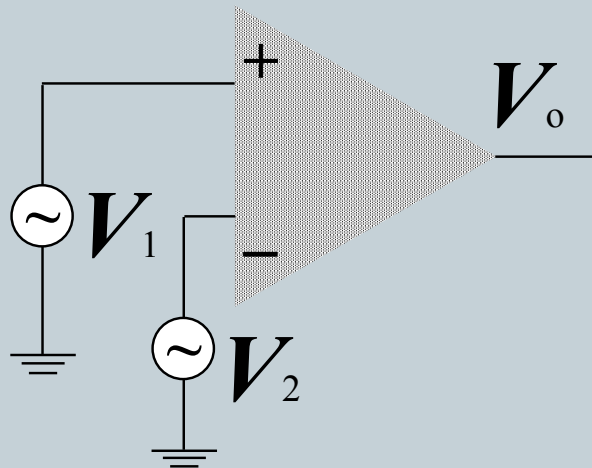
- + terminal : Ground
- - terminal : Source
- 180° phase change

Double-Ended Input

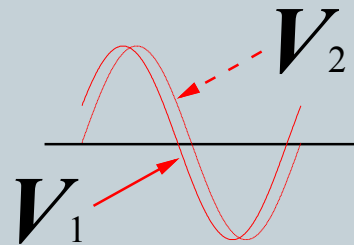
5



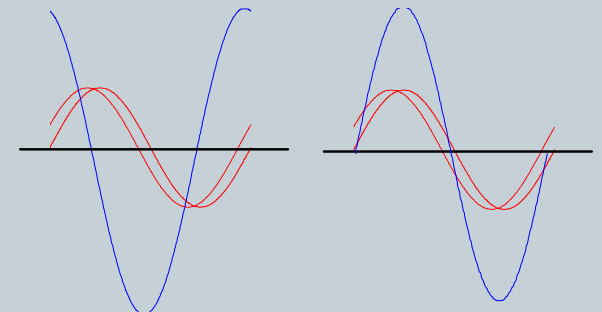
- Differential input
- $V_o = -V_d$
- 180° phase shift change between V_o and V_d



Qu: What V_o should be if,



Ans: (A or B) ?



(A)

(B)