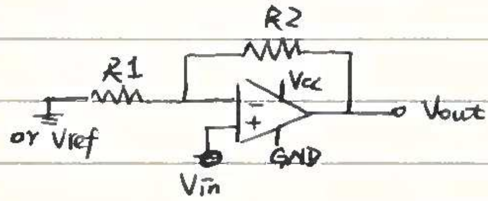
2022/07/05

Try amplifier MCP 6001 & LM741

Operational Amplifier



Typical Application

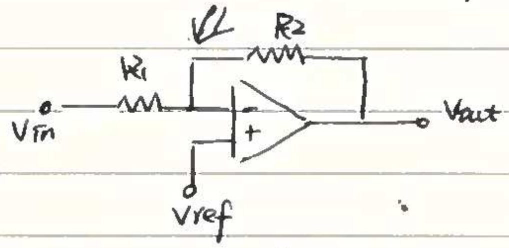
$$Gain = 1 + \frac{R_2}{R_1} = \frac{R_1 + R_2}{R_1}$$

⇓

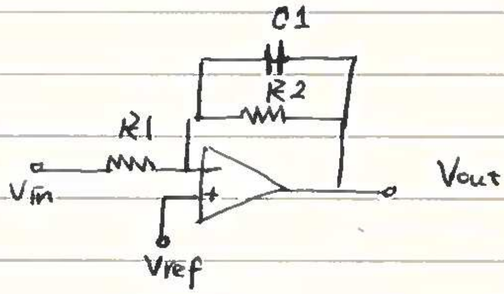
Non-inverting

when V+ > V- increase output

when V- > V+ decrease output.



$$Gain = 1 + \frac{R_2}{R_1}$$



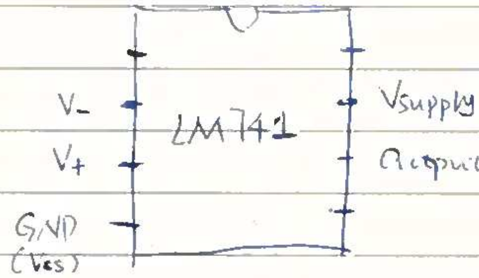
My application

(~~non-inverting~~)

(Inverting)

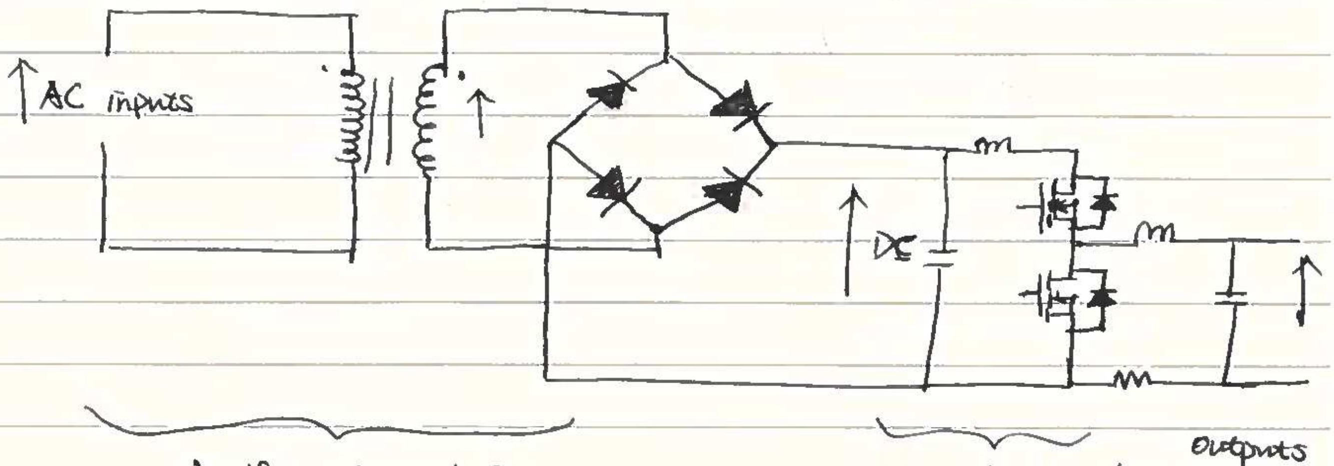
when V- > V+ thus reduce output.

when V- < V+ thus increase output



Important Discover: The input power supply → AC instead of DC which is discovered when using it as power supply for amplifiers.

Buck Converter does not have rectifier implanted between inputs and switches. (with isolation better)



rectifier with Isolation

has isolation design too but this is the orginal design of buck converter

Find LM741 Teaxes Instrument ~~⇒~~ LTspice model

How to ~~pick~~ ~~the~~ choose an operational amplifier

Power input/output & Frequency.

V_{DD} & V_{SS} → Maximum Rating Entry (Absolute)

positive negative (GND) output within power supply.

Freq: Slew Rate / Unity Gain Bandwidth / Gain Bandwidth Product

↓

how fast the output can change

Volts/~~ms~~ μs (gain could affect it)

↓

Maximum freq obtained at given gain ⇒ GBW

Gain × freq (max)

if $f = 100kHz$ Gain $= 1000$

⇒ ~~[illegible]~~

$\Rightarrow 100k \times \frac{1}{1000} = 100MHz$ GBW.

Here → inputs difference 0.1mV or even smaller

output 5V $\Rightarrow \frac{5}{0.1mV} = 10000 \times 5 = 5 \times 10^4$ Gain

$5 \times 10^4 \times 2.25M \rightarrow$ ~~10~~ $11.25 \times 10^4 MHz$

112.5 GHz GBW

LT1413 → work well in LTspice

↓ $V_{DD} = 5V$ → input 10mV → output $I_d = 1A$

0.3V/μs (10mΩ Rsense)

LM741 → X → cannot support 4.7V output by the same circuit

↓ → only give 3.6V output → 30mA I_d.

0.5 or 0.7 V/μs