SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

Accredited by NBA-AICTE and Accredited by NAAC – UGC with A++ Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

23EET202 / DIGITAL ELECTRONICS AND LINEAR INTEGRATED CIRCUITS

II YEAR / III SEMESTER

UNIT-I: OPERATIONAL AMPLIFIER

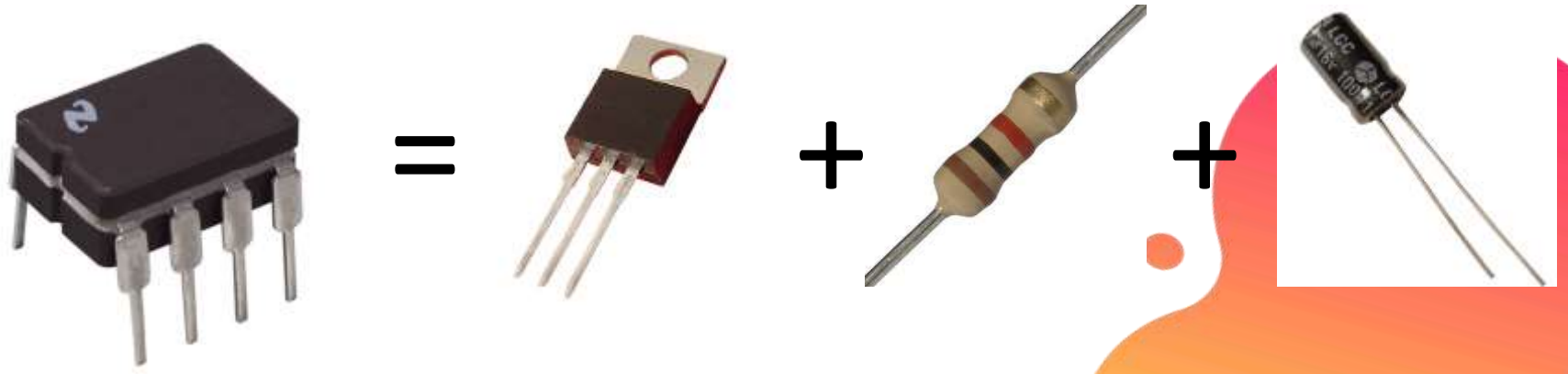
OP-AMP INVERTING / NON INVERTING

TOPIC OUTLINE

Basics of Op-Amp
Inverting Op-Amp Circuits
Non Inverting Op-Amp Circuits

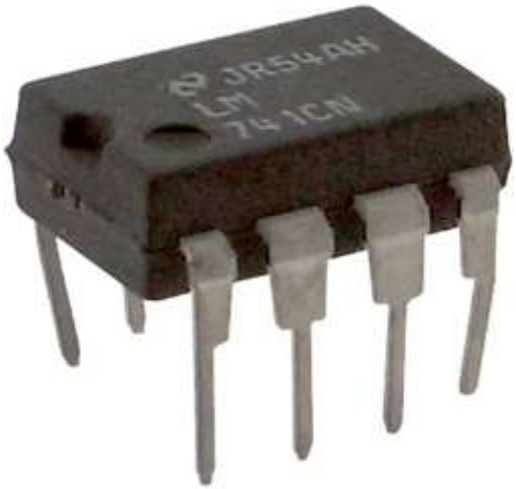
WHAT IS AN OP-AMP?

- An *Operational Amplifier* (known as an “Op-Amp”) is a device that is used to amplify a signal using an external power source
- Op-Amps are generally composed of:
  - Transistors, Resistors, Capacitors

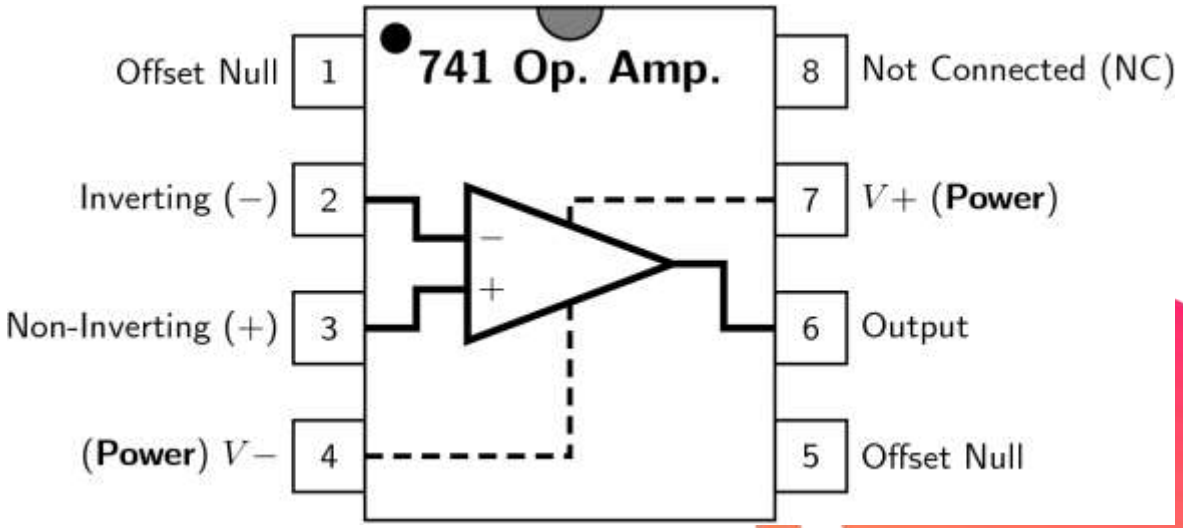


IC741 – PIN DETAILS

- Leading to the advent of the modern IC which is still used even today (1967 – present)



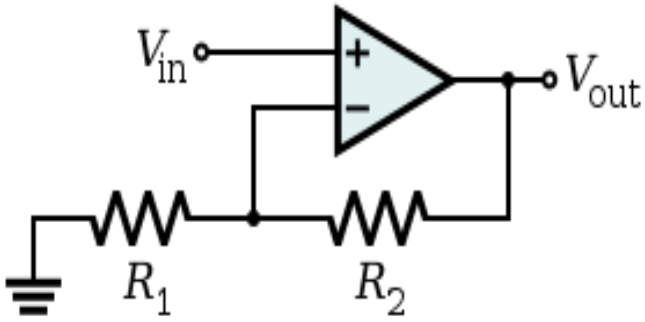
Fairchild µA741



Electrical Schematic of µA741

NON-INVERTING OP-AMP

- Amplifies the input voltage by a constant
- Closed loop op-amp
- Voltage input connected to non-inverting input
- Voltage output connected to inverting input through a feedback resistor
- Inverting input is also connected to ground
- Non-inverting input is only determined by voltage output

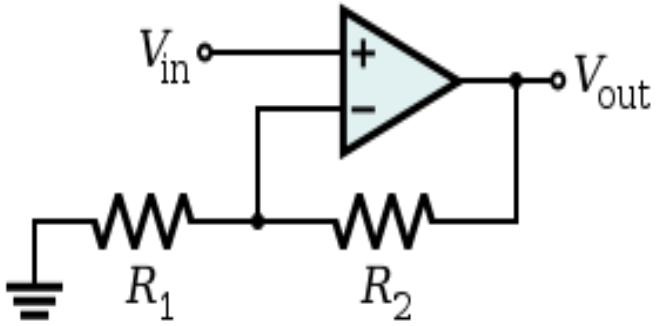


NON-INVERTING OP-AMP

$V_o = K(V_+ - V_-)$ & $R_2 = R_f$

R1/(R1+R2) ← Voltage Divider

$V_i = V_o\ (R_1/(R_1+R_2))$

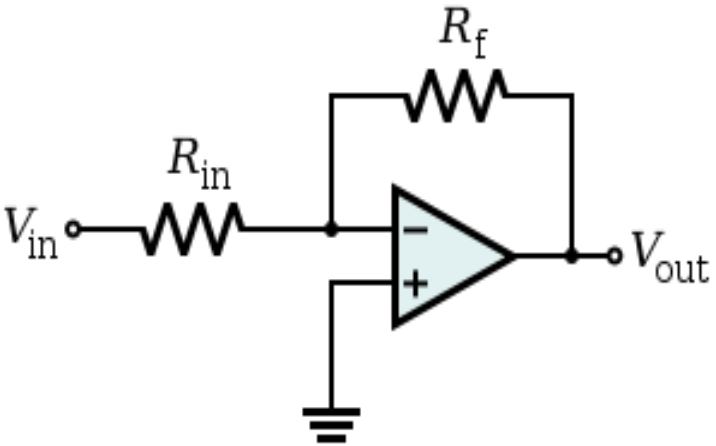


$V_o / V_i = Acl = [1+/(R_2+R_1)]$

$V_{out} = V_{in}\ (1+(R_2/R_1))$

INVERTING OP-AMP

- Amplifies and inverts the input voltage
- Closed loop op-amp
- Non-inverting input is determined by *both* voltage input and output
- The polarity of the output voltage is opposite to that of the input voltage
- Voltage input is connected to inverting input
- Voltage output is connected to inverting input through a feedback resistor
- Non-inverting input is grounded



INVERTING OP-AMP

$V_{out}=K(V_+-V_-)$

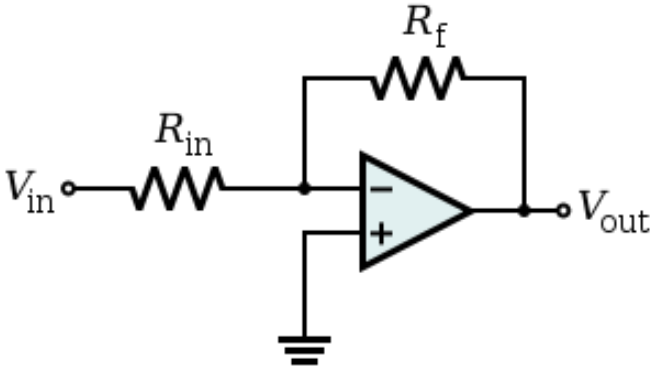
Nodal equation at “a” (jn) is

$0=((V_a-V_i)/R_i)) + ((V_a-V_o)/R_f))$

Since V_a=is virtual gnd = 0

$0=((0-V_i)/R_i)) + ((0-V_o)/R_f))$

$V_o /V_i = -R_f/R_i = Acl$



$V_{out}=-V_{in}R_f/R_{in}$

THANK YOU