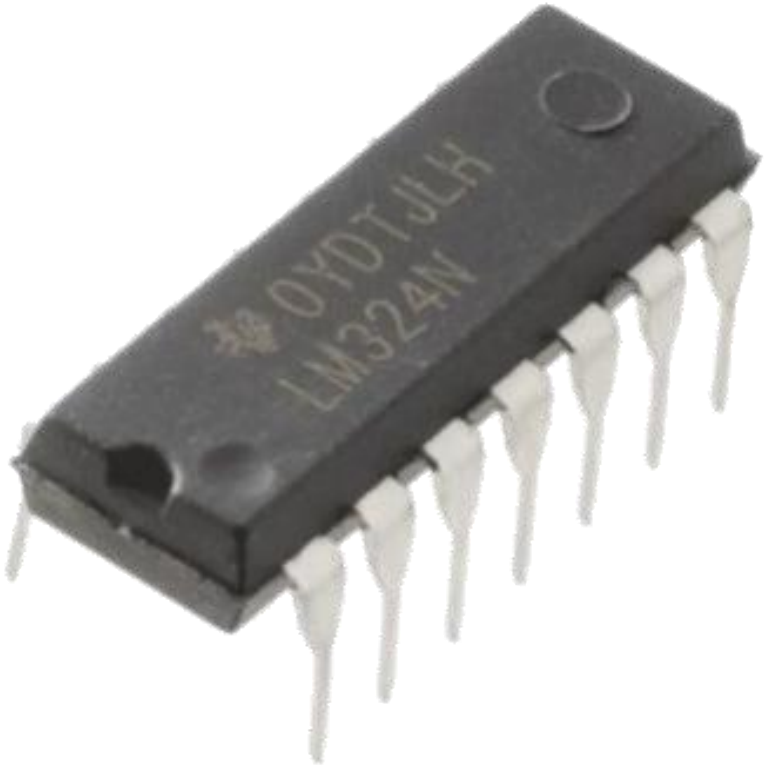
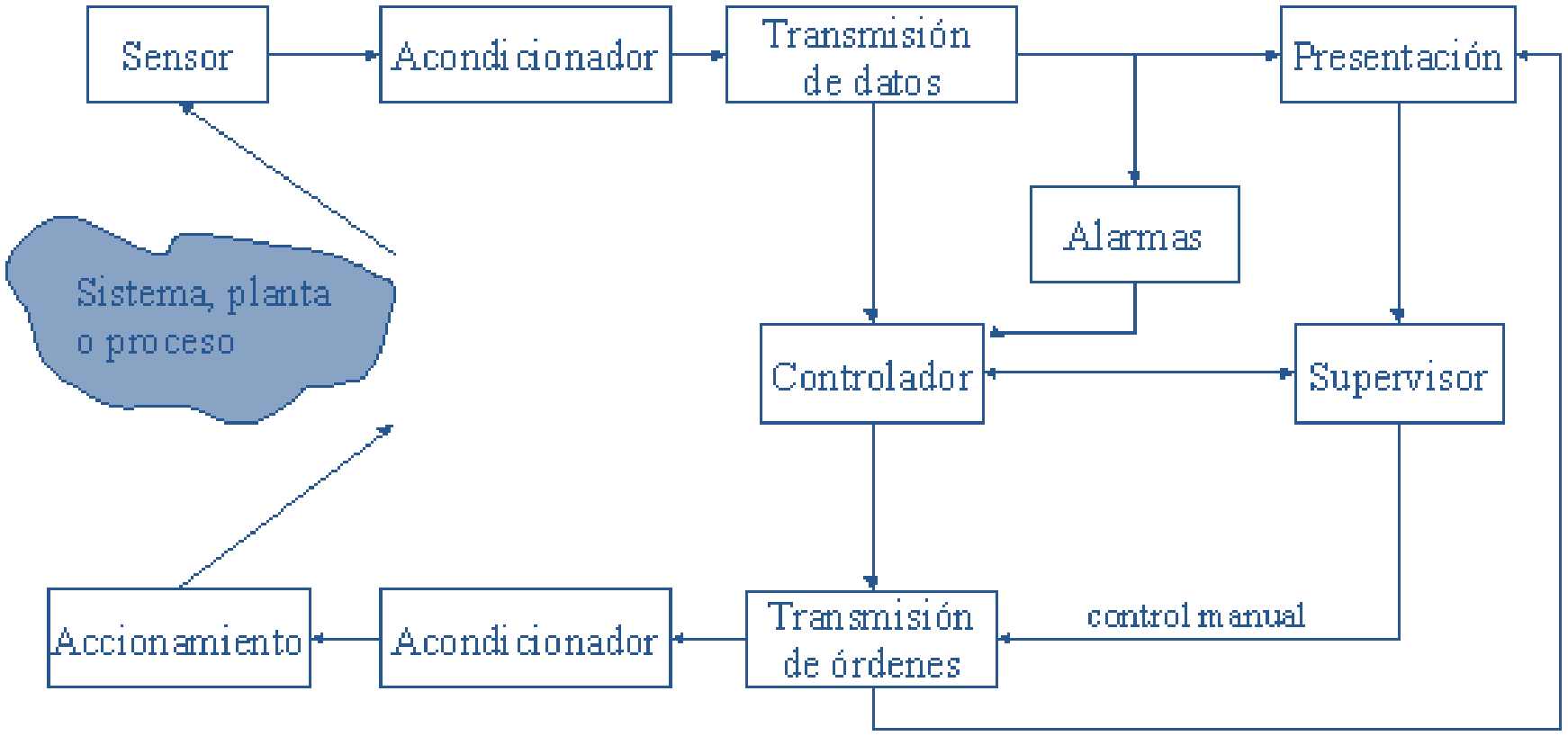
Sensores y Laboratorio 2019-I

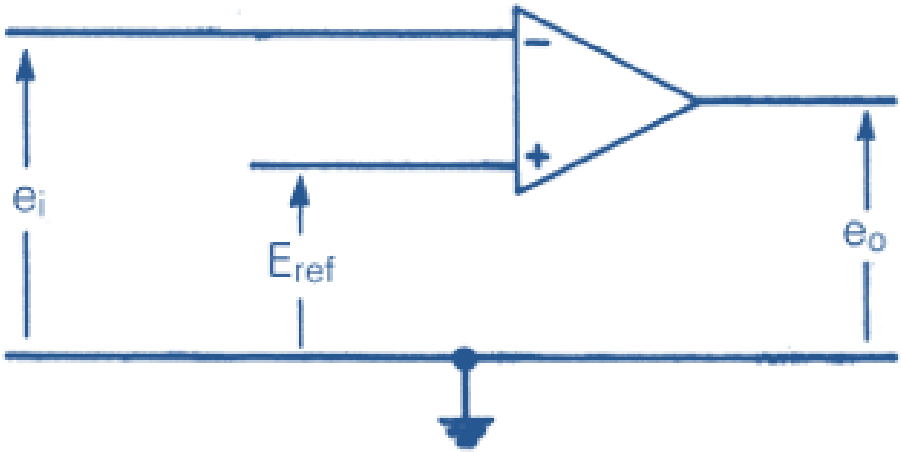
Ing. Juan Ricardo Clavijo Mendoza MSc.

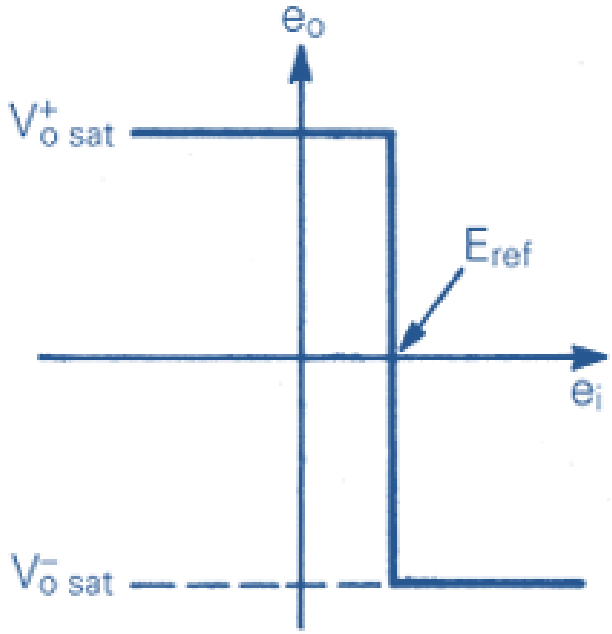
Introducción al curso

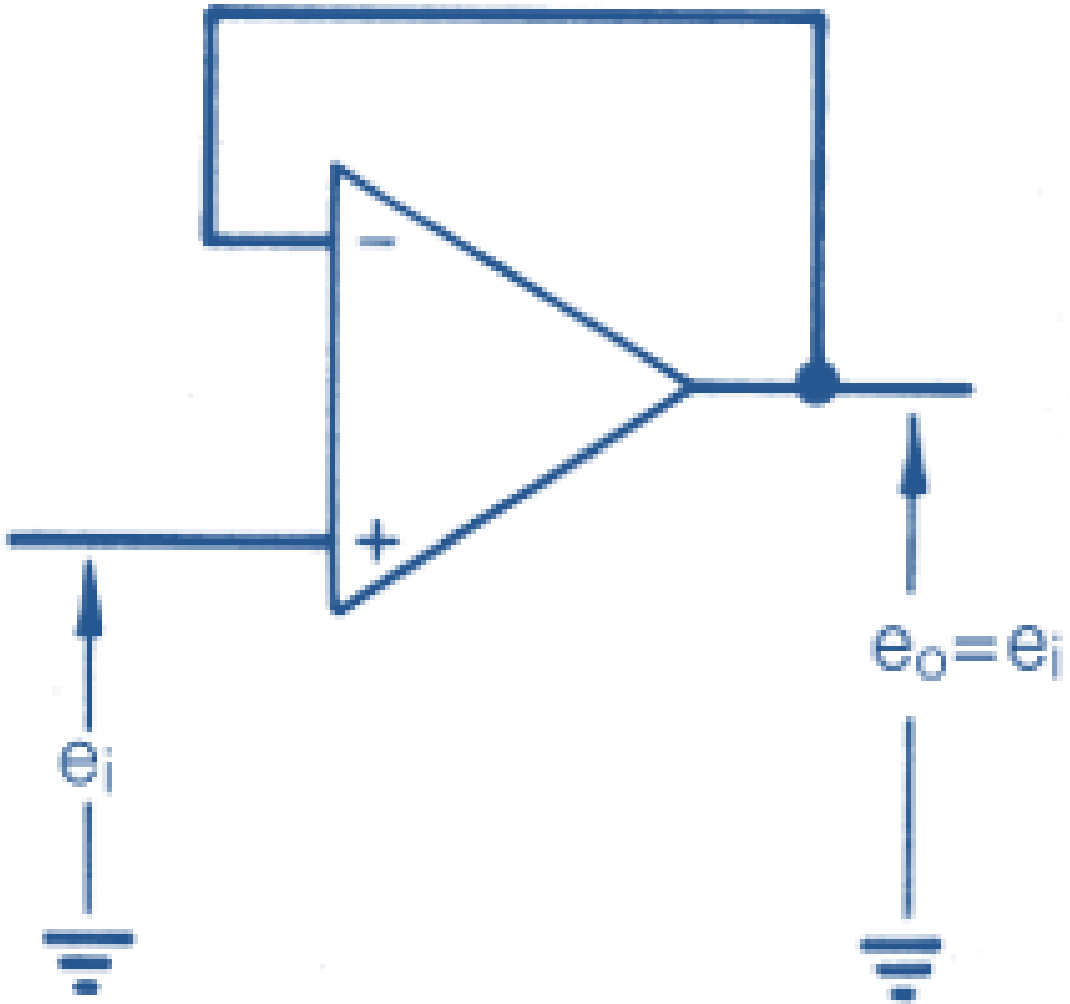


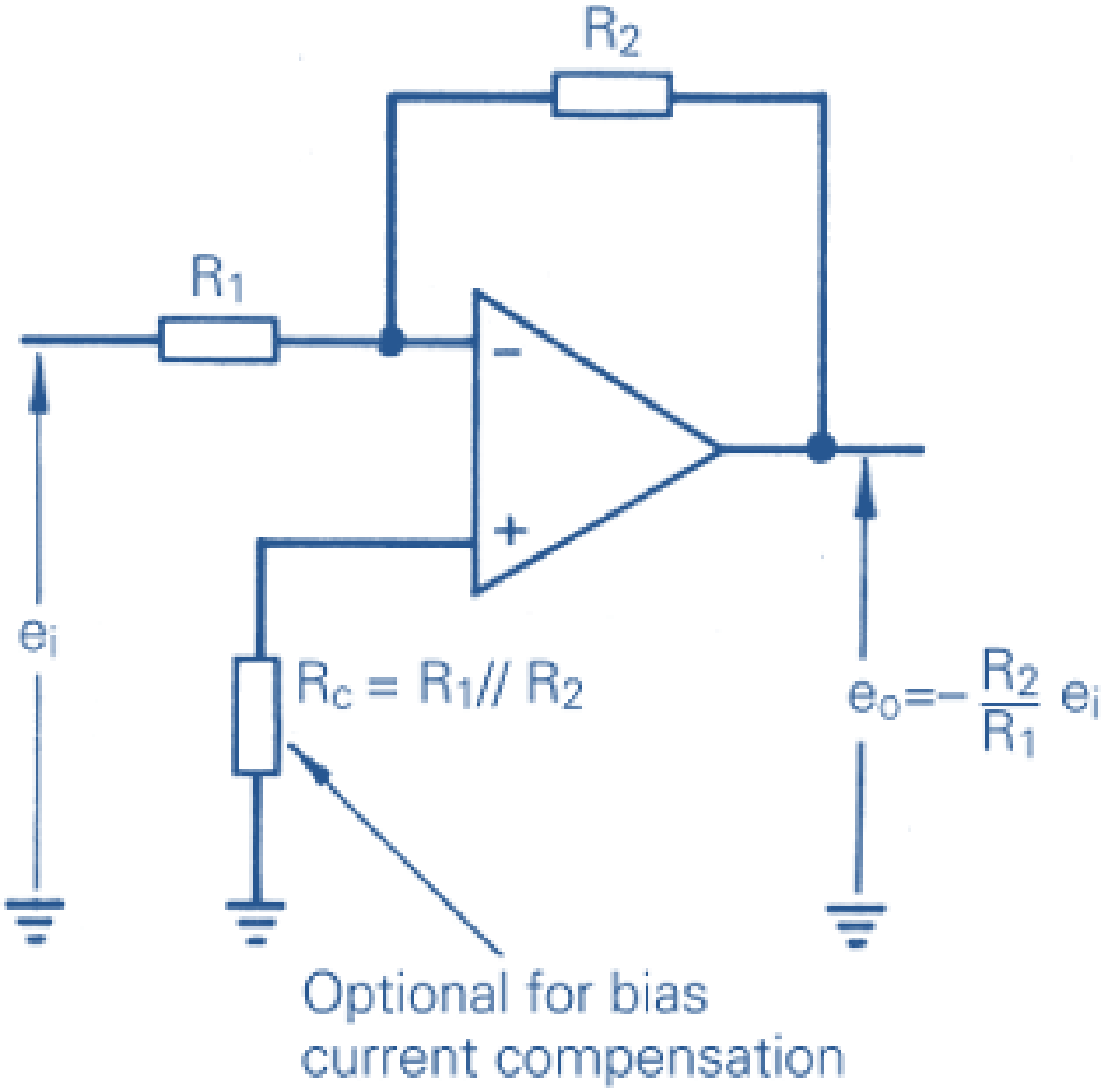
Control Automático

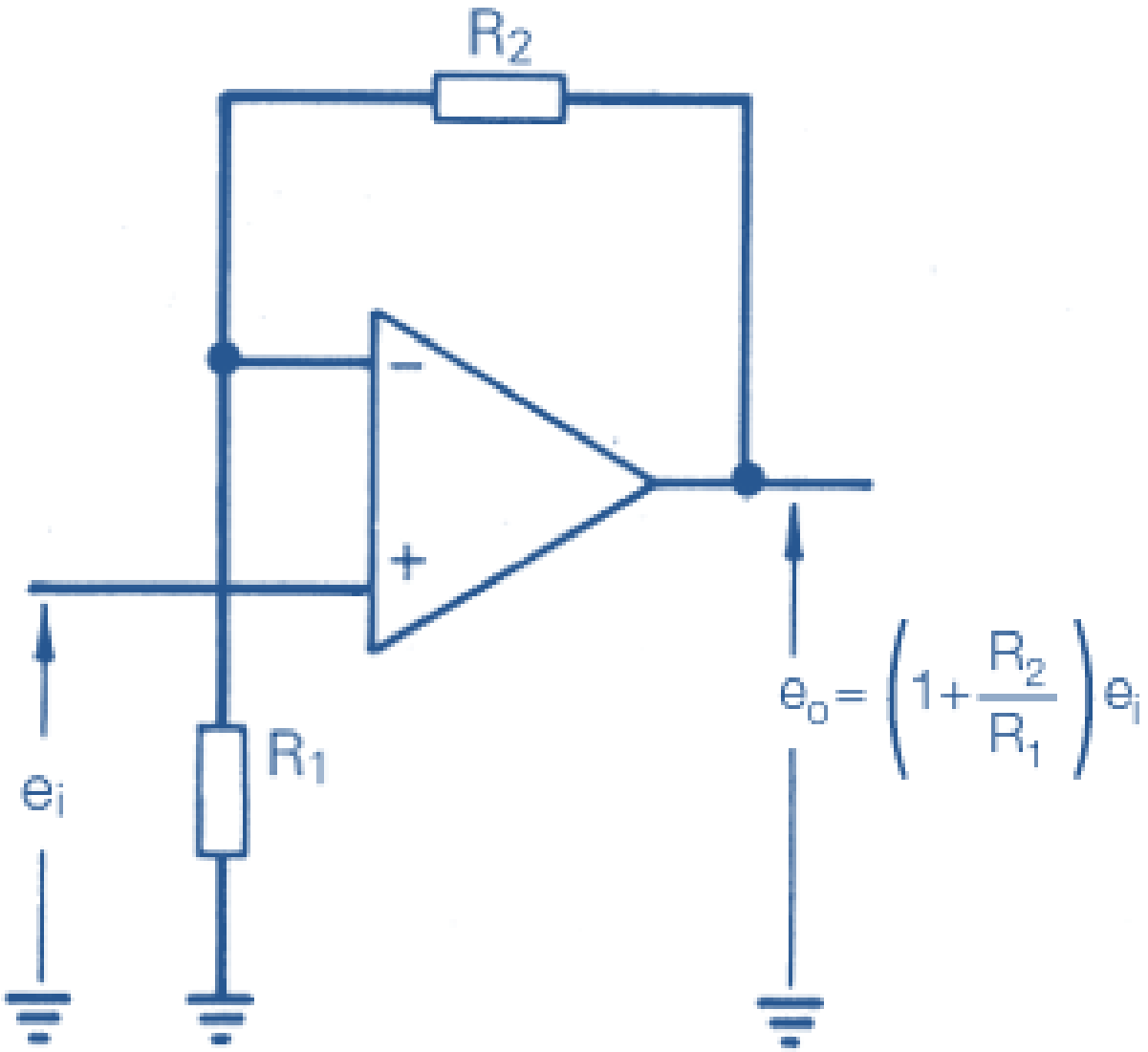


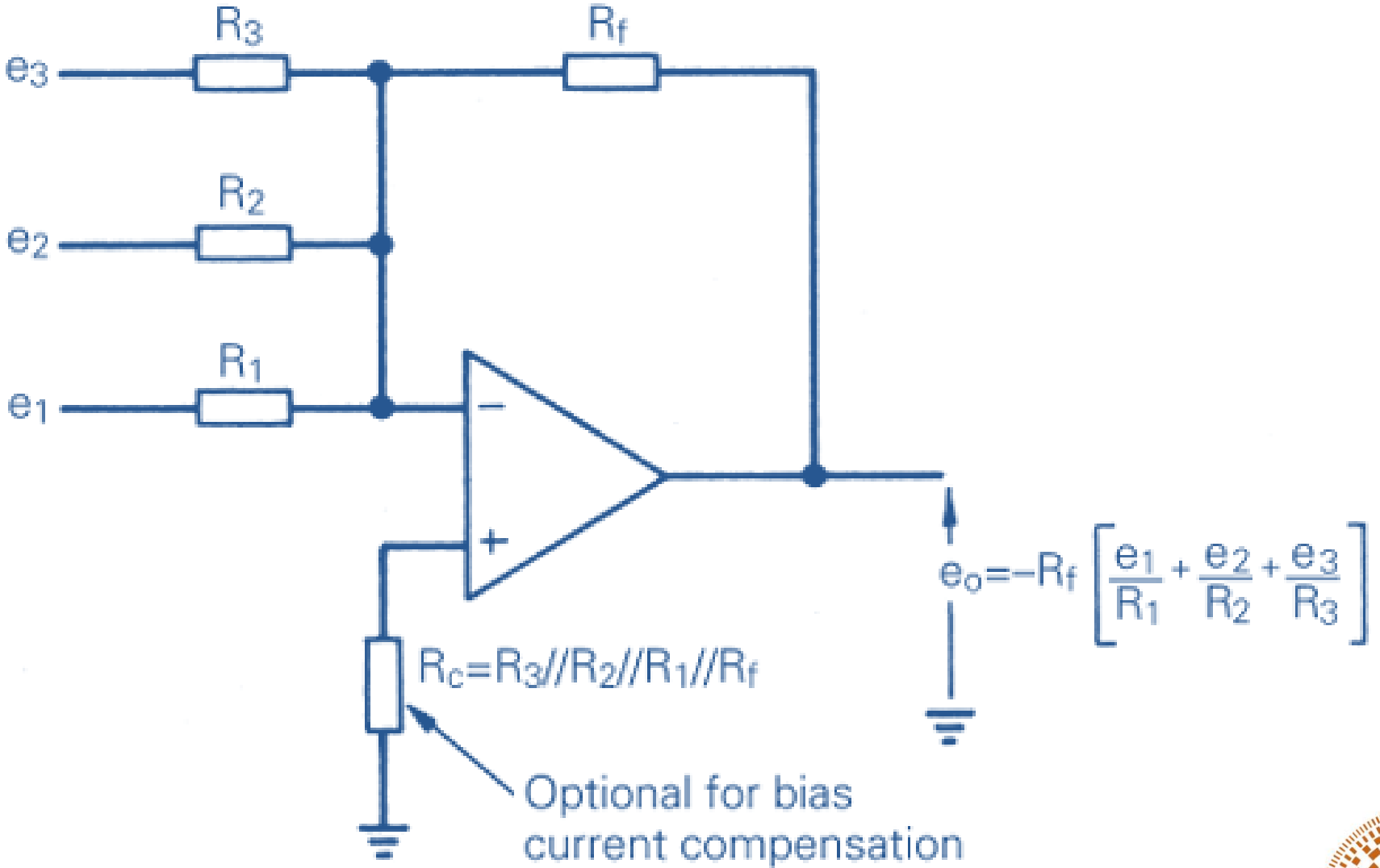

ei
Eref
eo

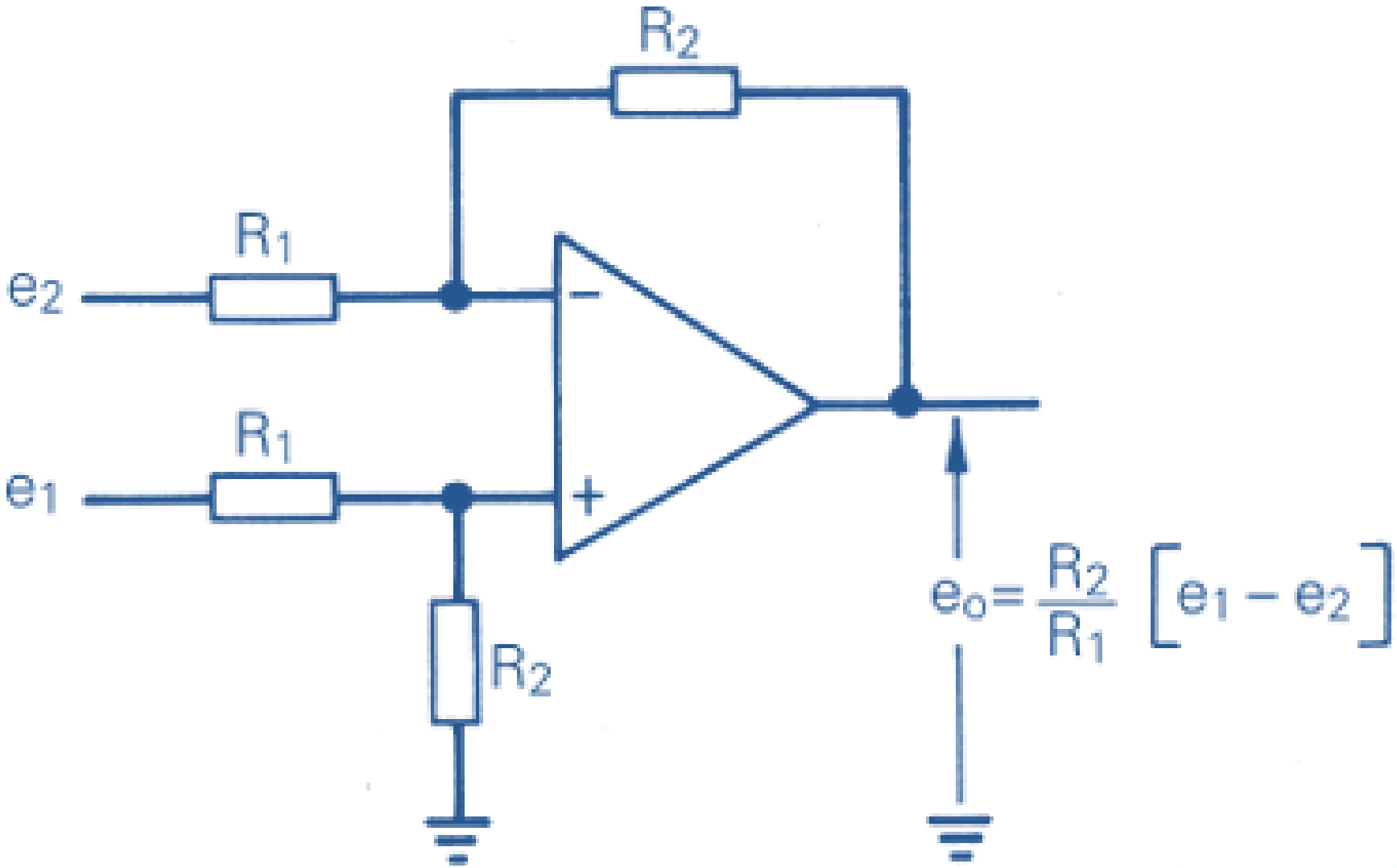

eo
V+o sat
Eref
ei
V−o sat

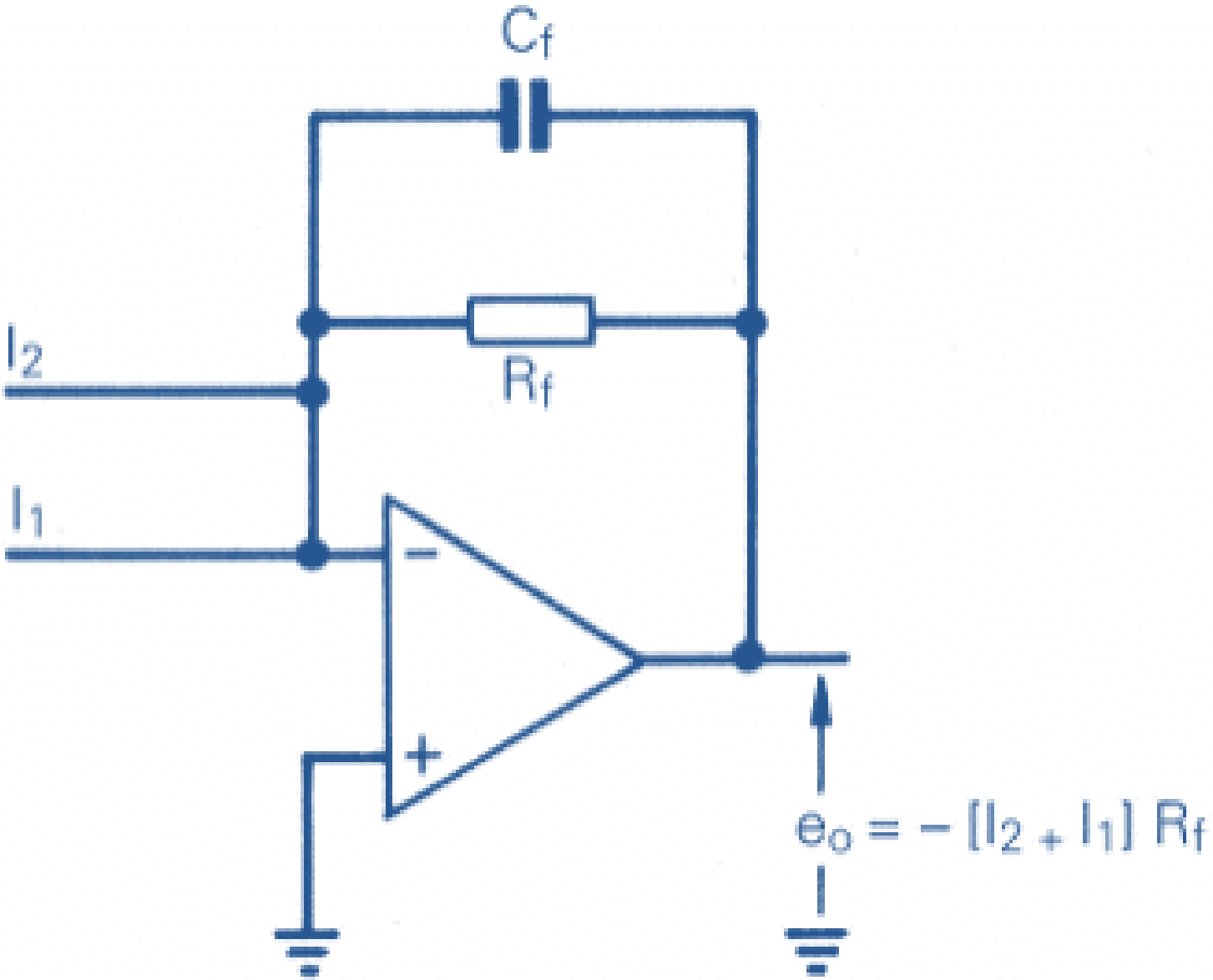

−
+
$e_o = e_i$
e_i

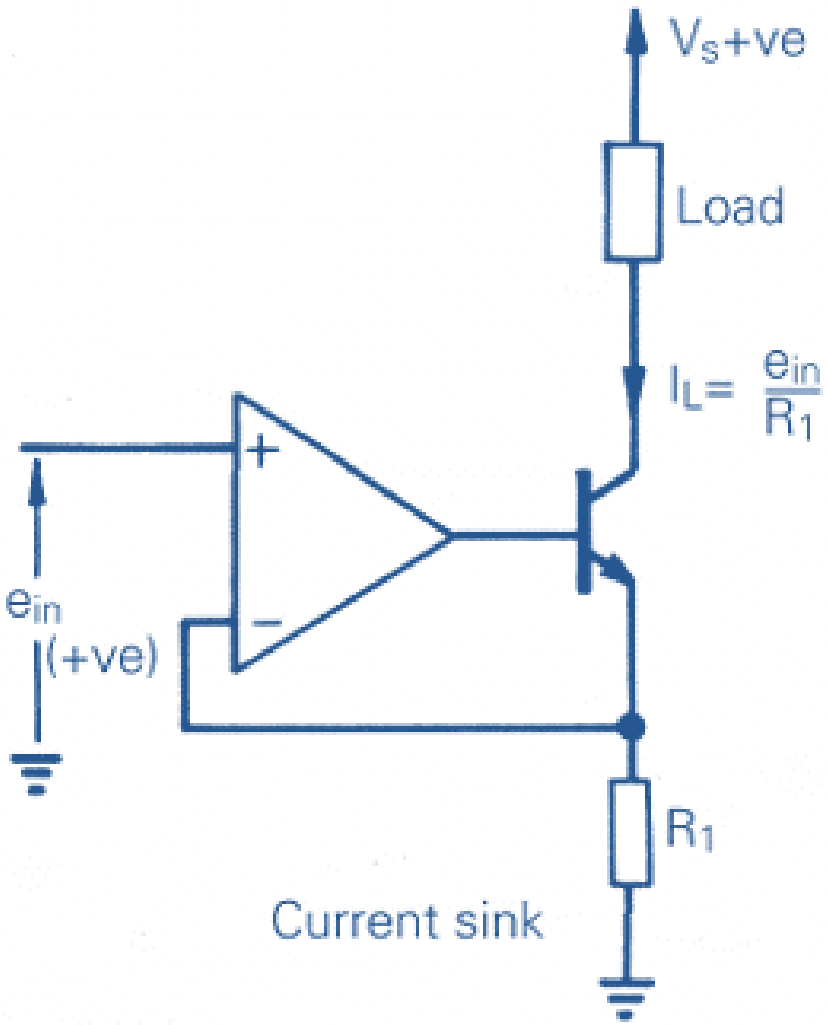

R2
R1
−
+
ei
Rc = R1// R2
eo=− R2/R1 ei
Optional for bias
current compensation

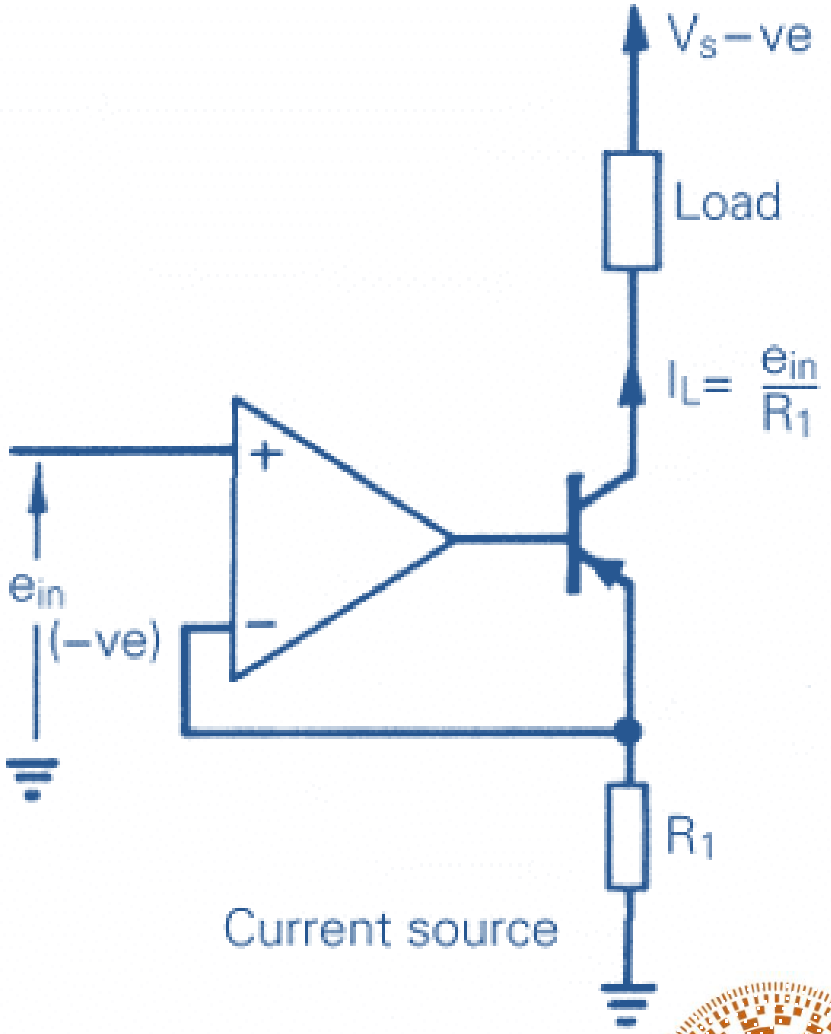

R2
R1
ei
eo = (1 + R2/R1) ei

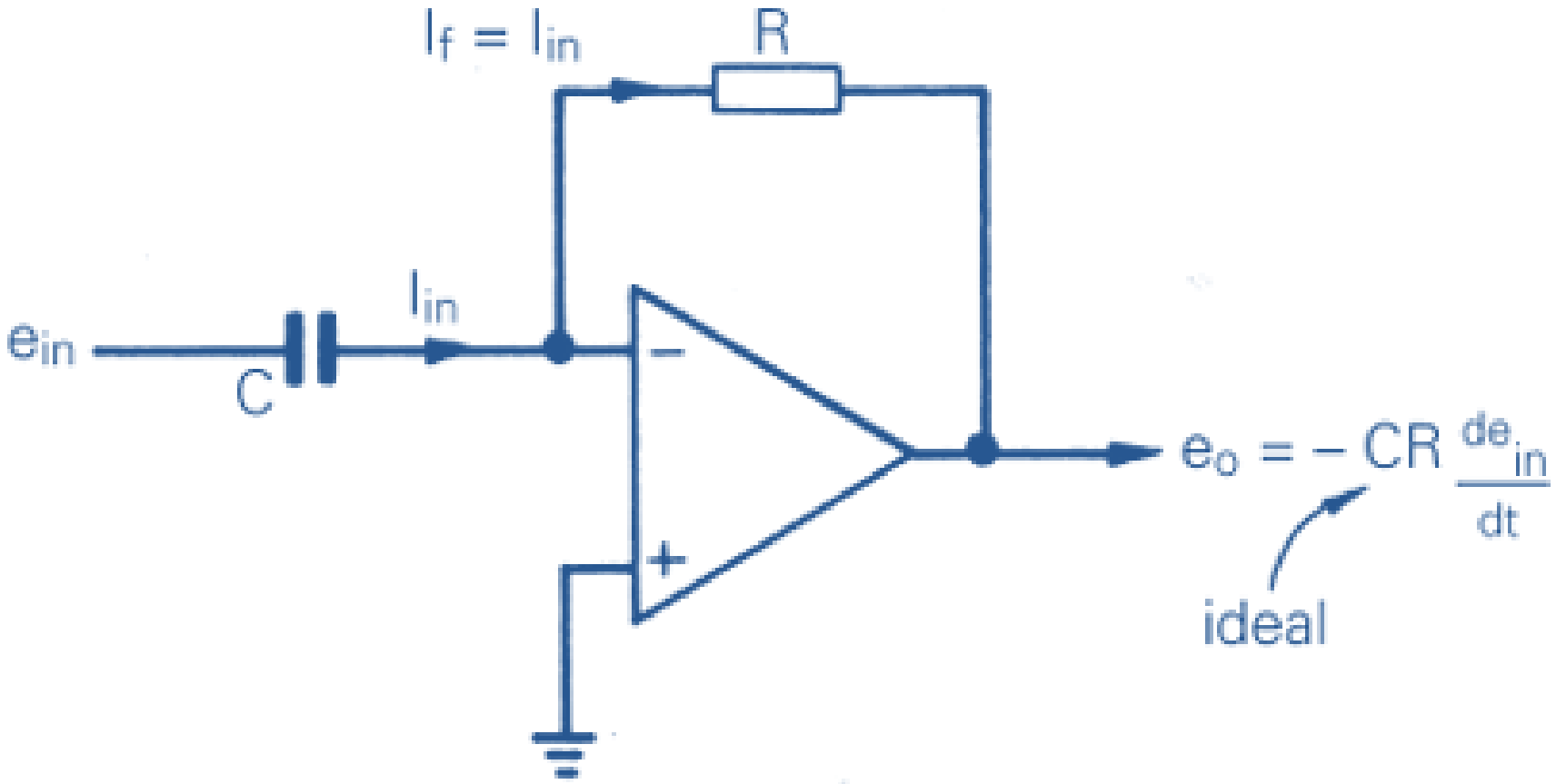

R3
Rf
e3
R2
e2
R1
e1
−
+
eo=−Rf [e1/R1 + e2/R2 + e3/R3]
Rc=R3//R2//R1//Rf
Optional for bias
current compensation

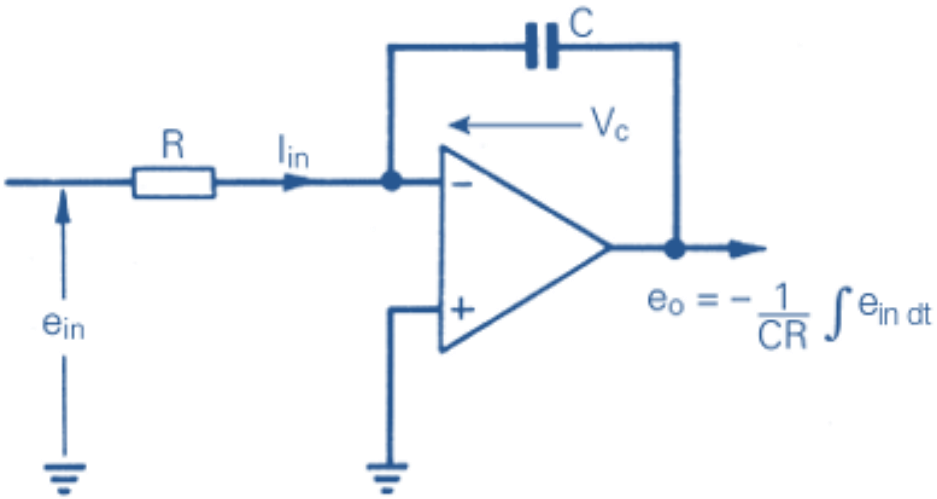

R2
R1
e2
R1
e1
R2
−
+
eo= R2/R1 [e1 − e2]

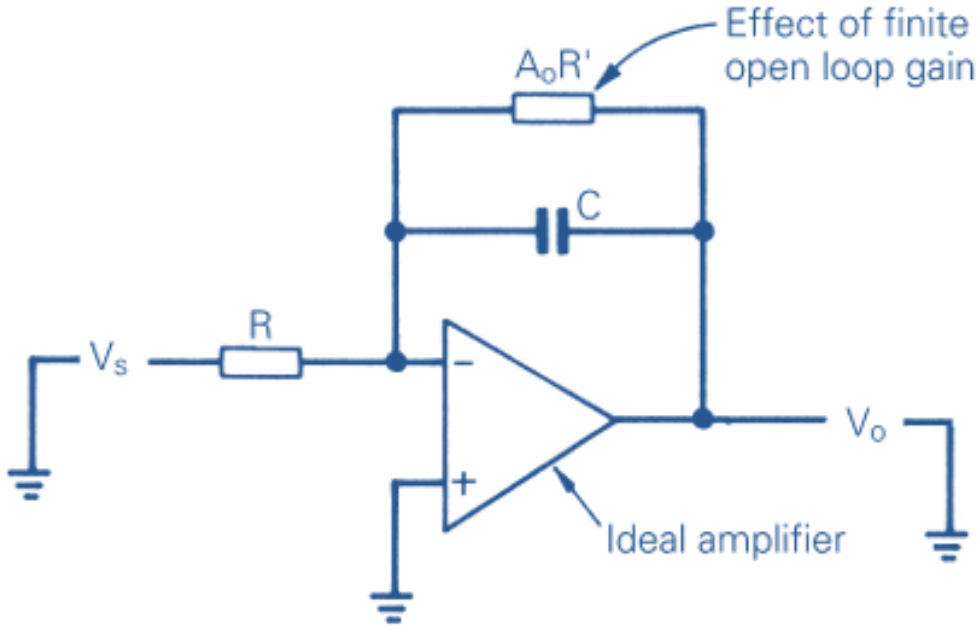

C_f
I_2
R_f
I_1
−
+
$e_o = -[I_2 + I_1] R_f$


Vs+ve
Load
IL= ein/R1
+
−
ein
(+ve)
R1
Current sink

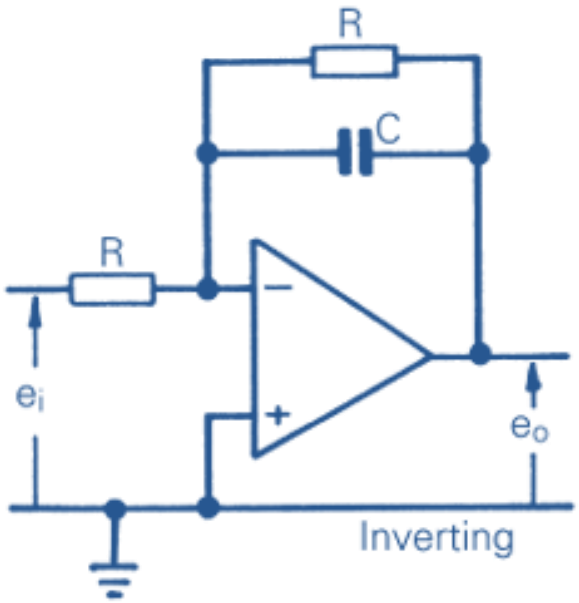

Vs−ve
Load
IL= ein/R1
+
−
ein
(−ve)
R1
Current source

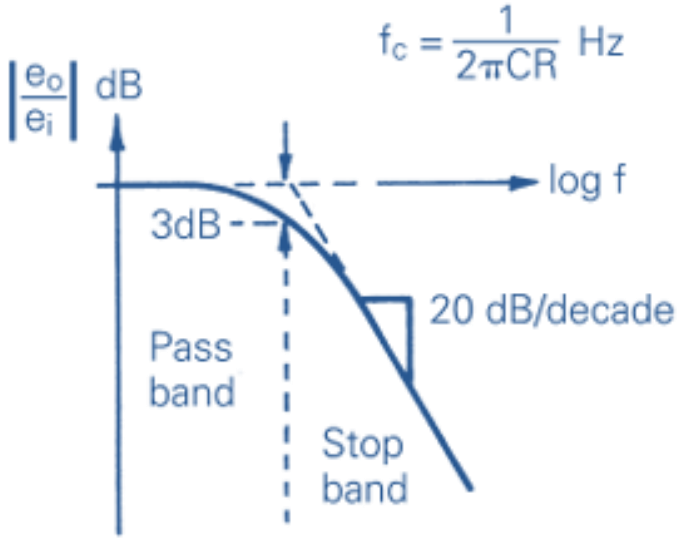

$I_f = I_{in}$
R
I_{in}
e_{in}
C
−
+
$e_o = -CR \frac{de_{in}}{dt}$
ideal

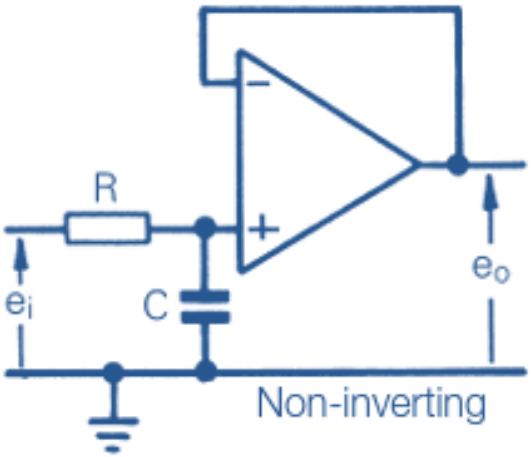

C
R
I_{in}
V_c
e_{in}
$e_o = -\frac{1}{CR}\int e_{in}\,dt$


Effect of finite
open loop gain
A_oR'
C
R
V_s
V_o
Ideal amplifier

Electrónica Análoga

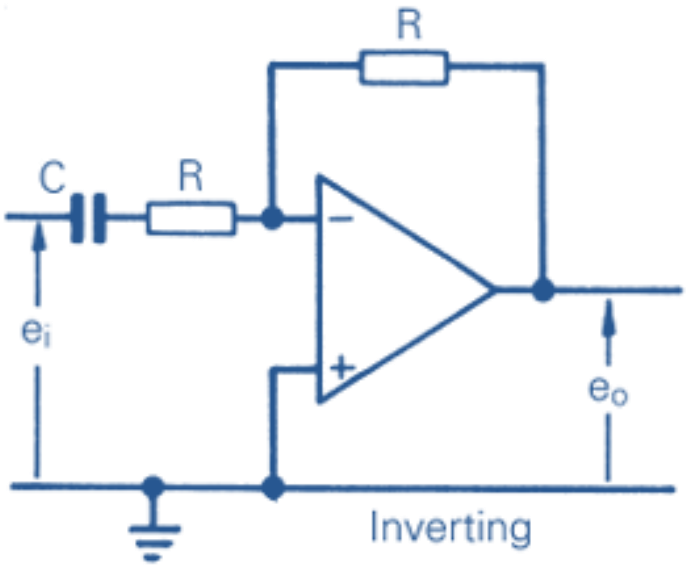




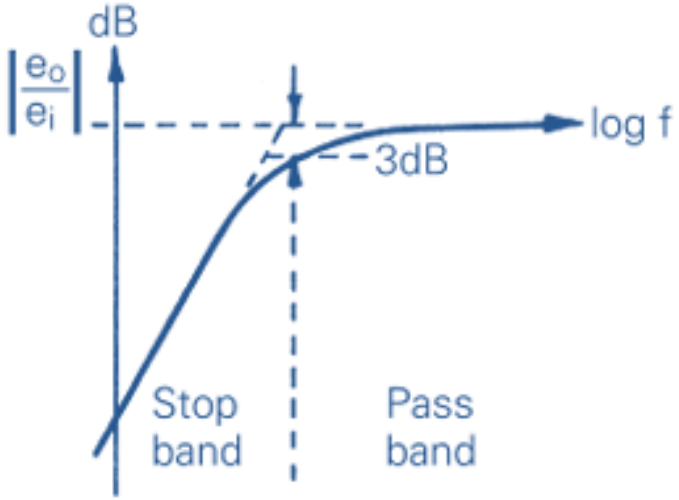


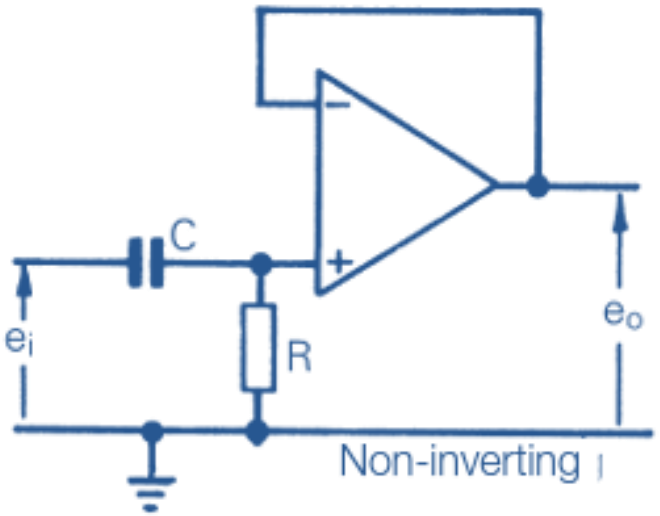
$$\frac{e_o}{e_{i(jf)}} = \frac{1}{1 + j\frac{f}{f_c}}$$

Electrónica Análoga

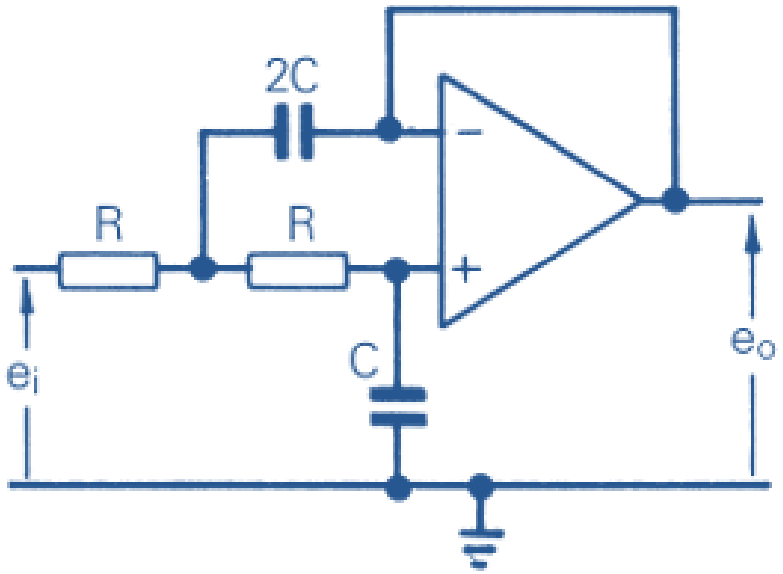


$$f_c = \frac{1}{2\pi CR} \text{ Hz}$$

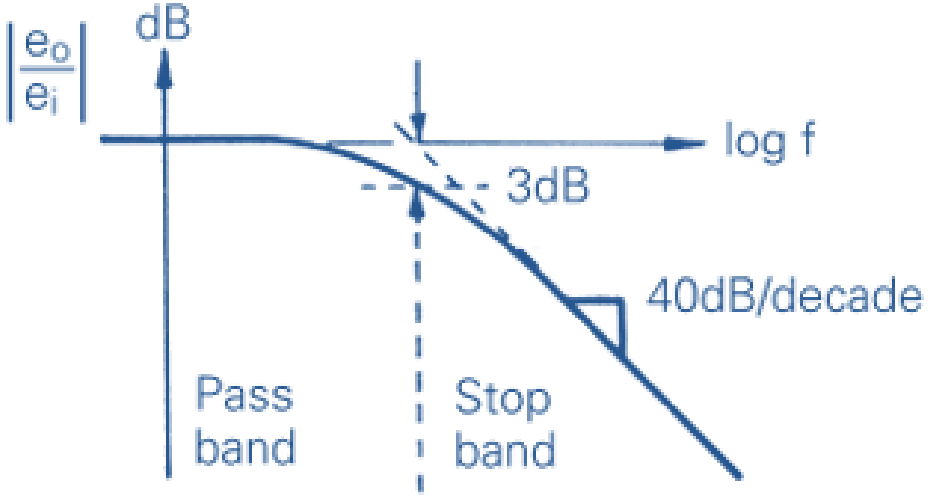




$$\frac{e_o}{e_{i(jf)}} = \frac{1}{1 - j\frac{f_c}{f}}$$

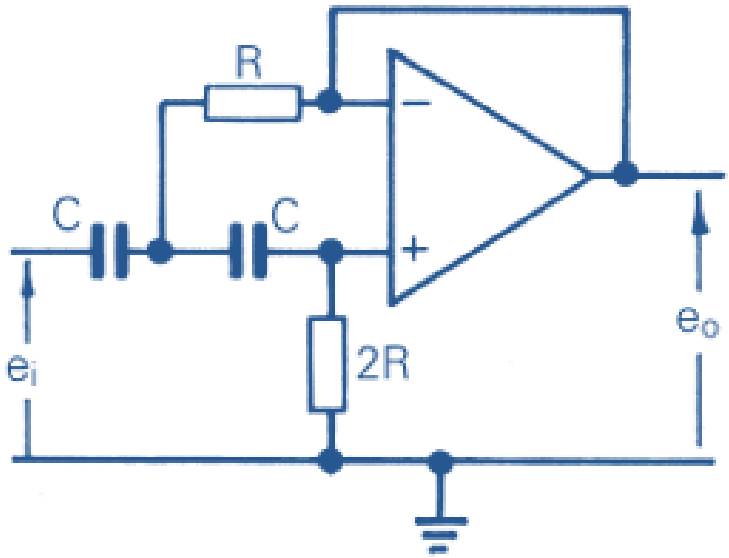


$$f_c = \frac{1}{2\sqrt{2}(\pi CR)} \text{ Hz}$$

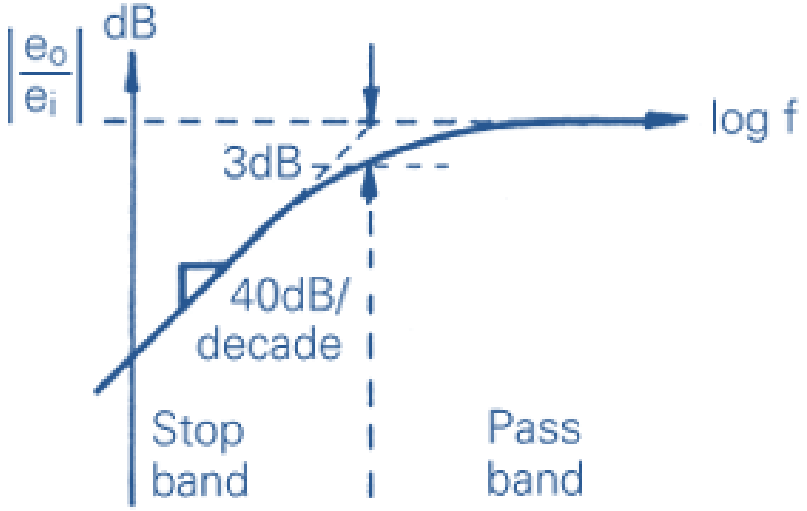


$$\text{Low pass } \frac{e_o}{e_{i(jf)}} = \frac{1}{1-\left(\frac{f}{f_c}\right)^2 + \sqrt{2}\left(j\frac{f}{f_c}\right)}$$

$$\left|\frac{e_o}{e_{i(jf)}}\right| = \frac{1}{\sqrt{\left\{\left[1-\left(\frac{f}{f_c}\right)^2\right]^2 + 2\left(\frac{f}{f_c}\right)^2\right\}}}$$

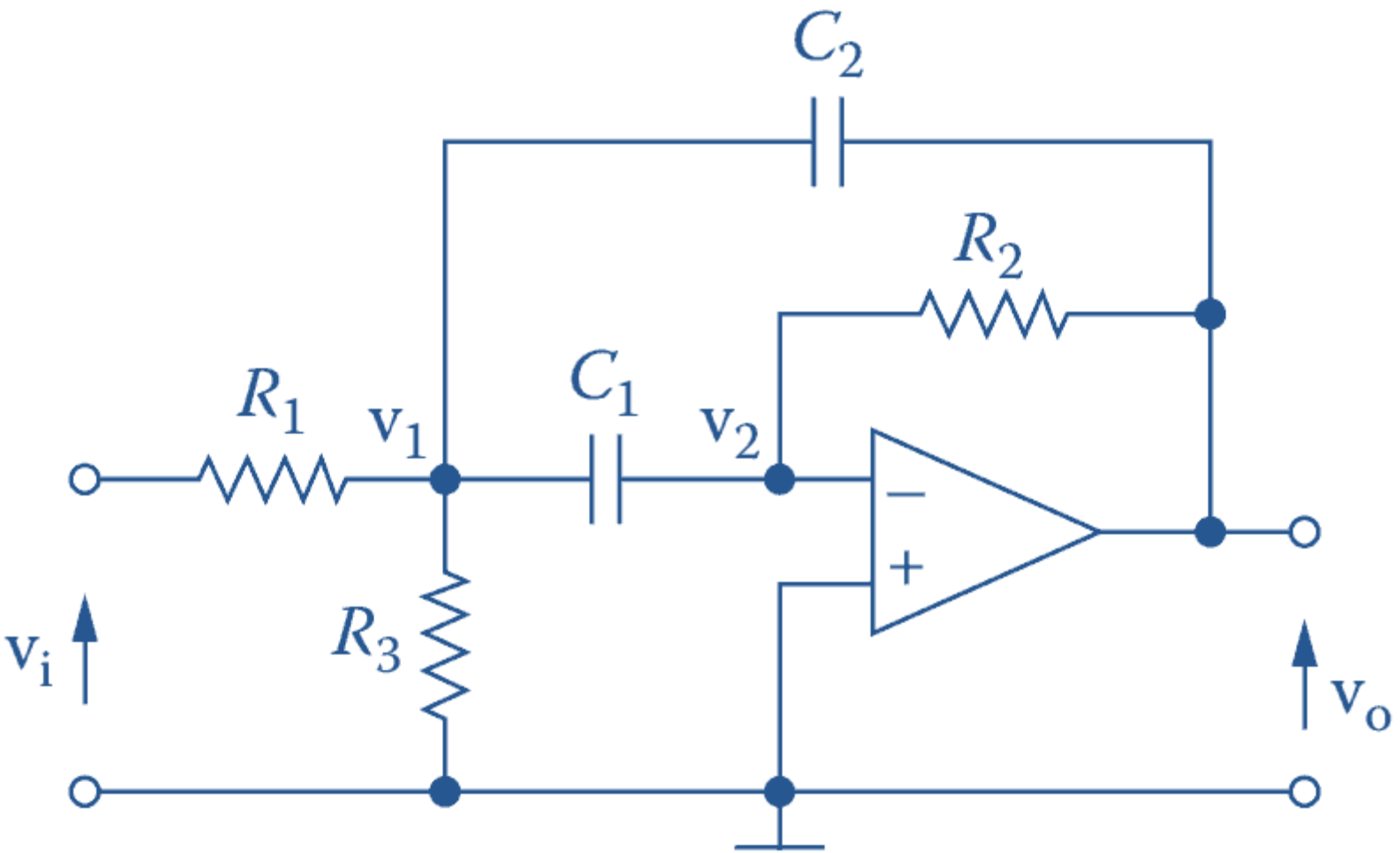


$$f_c = \frac{1}{2\sqrt{2}(\pi CR)} \text{ Hz}$$



$$\text{High pass } \frac{e_o}{e_{i(jf)}} = \frac{1}{1-\left(\frac{f_c}{f}\right)^2 - \sqrt{2}\left(j\frac{f_c}{f}\right)}$$

$$\left|\frac{e_o}{e_{i(jf)}}\right| = \frac{1}{\sqrt{\left\{\left[1-\left(\frac{f_c}{f}\right)^2\right]^2 + 2\left(\frac{f_c}{f}\right)^2\right\}}}$$


C2
R2
R1
v1
C1
v2
vi
R3
vo

Use resistencias, capacitores, inductores, y componentes en general, que sean comerciales!

No diseñe fantasías…

Electrónica Análoga

Factor	XXΩ	XXXΩ	XKΩ	XXKΩ	XXXKΩ	XMΩ
1	10	100	1000	10000	100000	1000000
1,1	11	110	1100	11000	110000	1100000
1,2	12	120	1200	12000	120000	1200000
1,3	13	130	1300	13000	130000	1300000
1,5	15	150	1500	15000	150000	1500000
1,6	16	160	1600	16000	160000	1600000
1,8	18	180	1800	18000	180000	1800000
2	20	200	2000	20000	200000	2000000
2,2	22	220	2200	22000	220000	2200000
2,4	24	240	2400	24000	240000	2400000
2,7	27	270	2700	27000	270000	2700000
3	30	300	3000	30000	300000	3000000
3,3	33	330	3300	33000	330000	3300000
3,6	36	360	3600	36000	360000	3600000
3,9	39	390	3900	39000	390000	3900000
4,3	43	430	4300	43000	430000	4300000
4,7	47	470	4700	47000	470000	4700000
5,1	51	510	5100	51000	510000	5100000
5,6	56	560	5600	56000	560000	5600000
6,2	62	620	6200	62000	620000	6200000
6,8	68	680	6800	68000	680000	6800000
7,5	75	750	7500	75000	750000	7500000
8,2	82	820	8200	82000	820000	8200000
9,1	91	910	9100	91000	910000	9100000

LM78XX / LM78XXA
3-Terminal 1 A Positive Voltage Regulator

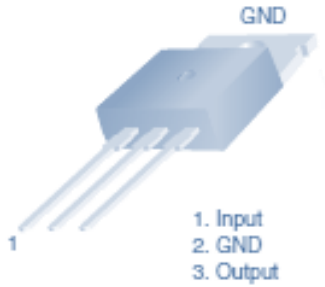
Features

- Output Current up to 1 A
- Output Voltages: 5, 6, 8, 9, 10, 12, 15, 18, 24 V
- Thermal Overload Protection
- Short-Circuit Protection
- Output Transistor Safe Operating Area Protection

Description

The LM78XX series of three-terminal positive regulators is available in the TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut-down, and safe operating area protection. If adequate heat sinking is provided, they can deliver over 1 A output current. Although designed primarily as fixed-voltage regulators, these devices can be used with external components for adjustable voltages and currents.

TO-220 (Single Gauge)



1. Input
2. GND
3. Output

KA79XX / KA79XXA / LM79XX
3-Terminal 1 A Negative Voltage Regulator

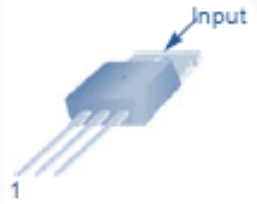
Features

- Output Current in Excess of 1 A
- Output Voltages of: -5 V, -6 V, -8 V, -9 V, -12 V, -15 V, -18 V, -24 V
- Internal Thermal Overload Protection
- Short-Circuit Protection
- Output Transistor Safe Operating Area Compensation

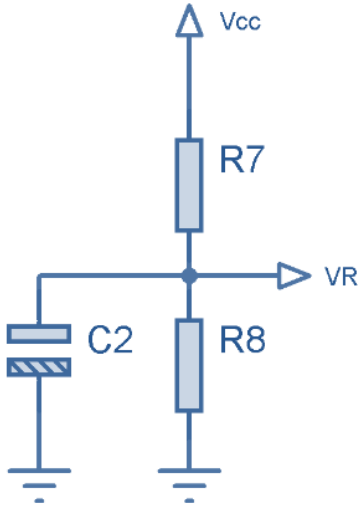
Description

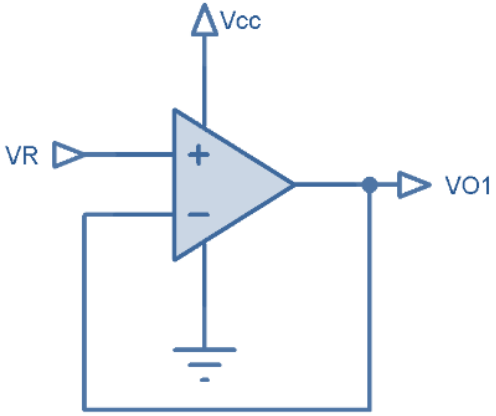
The KA79XX / KA79XXA / LM79XX series of three-terminal negative regulators are available in a TO-220 package with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shutdown, and safe operating area protection.

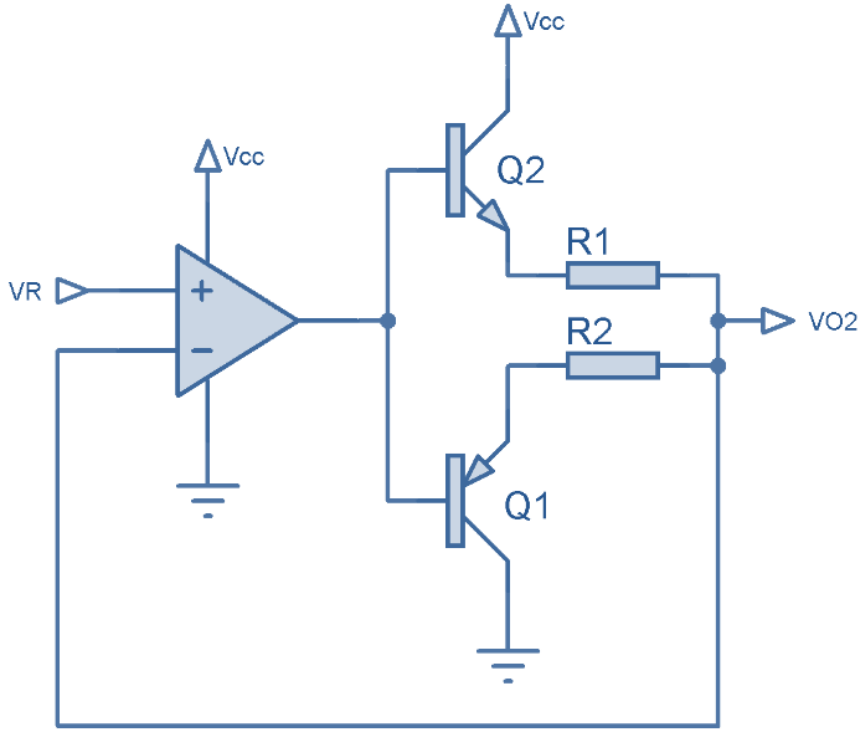
TO-220

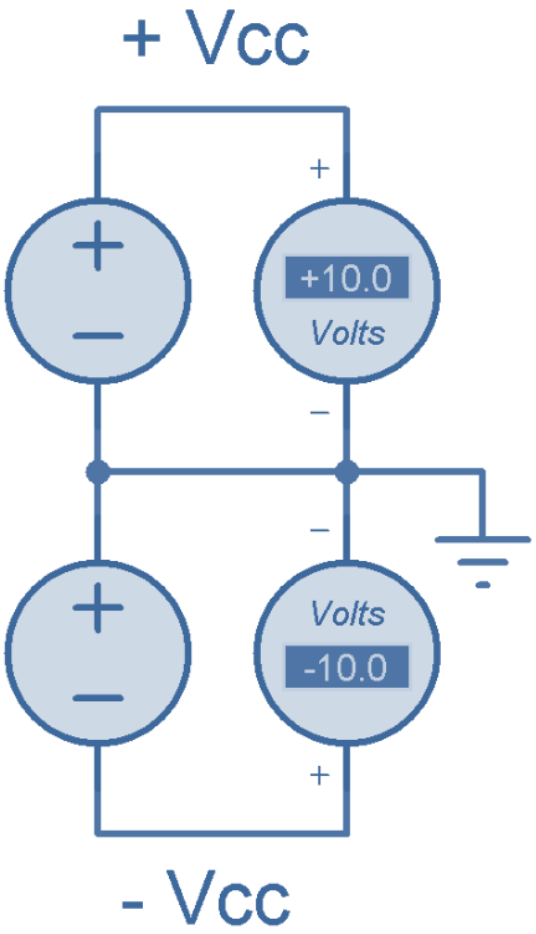


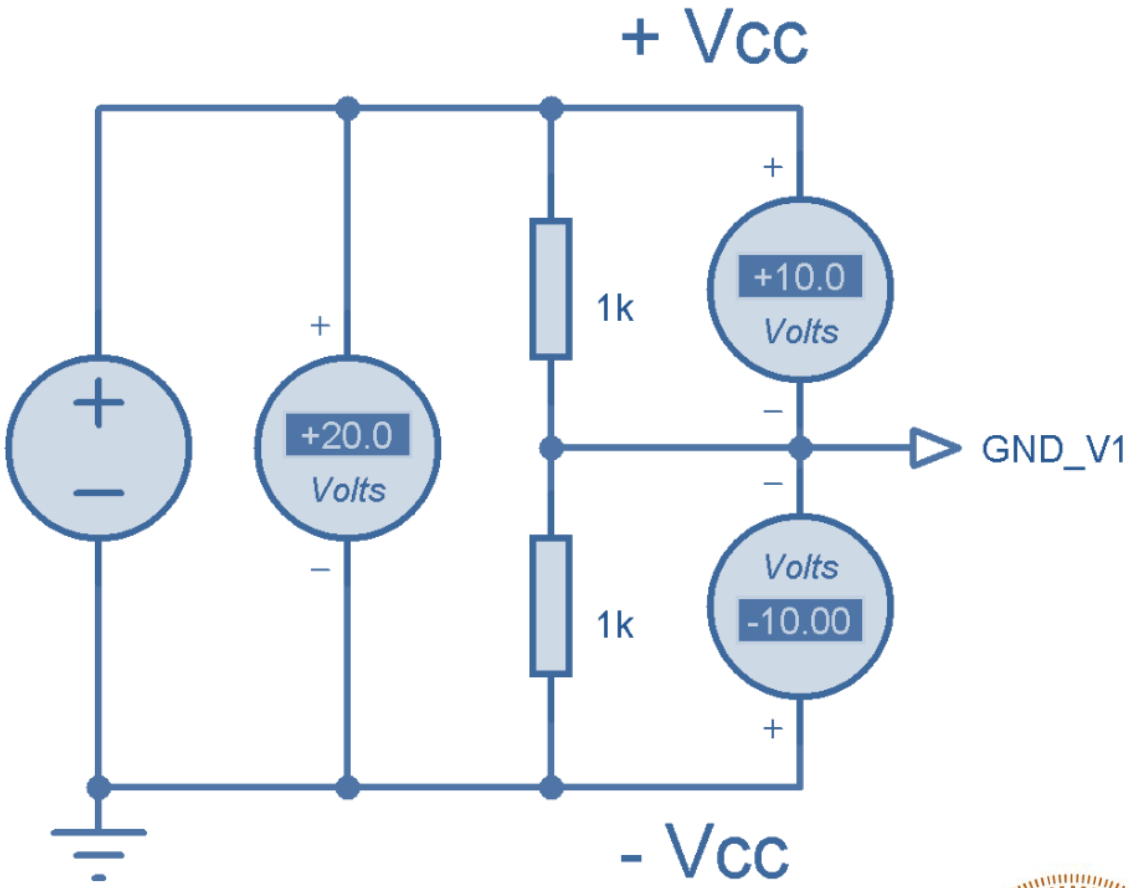
1. GND 2. Input 3. Output

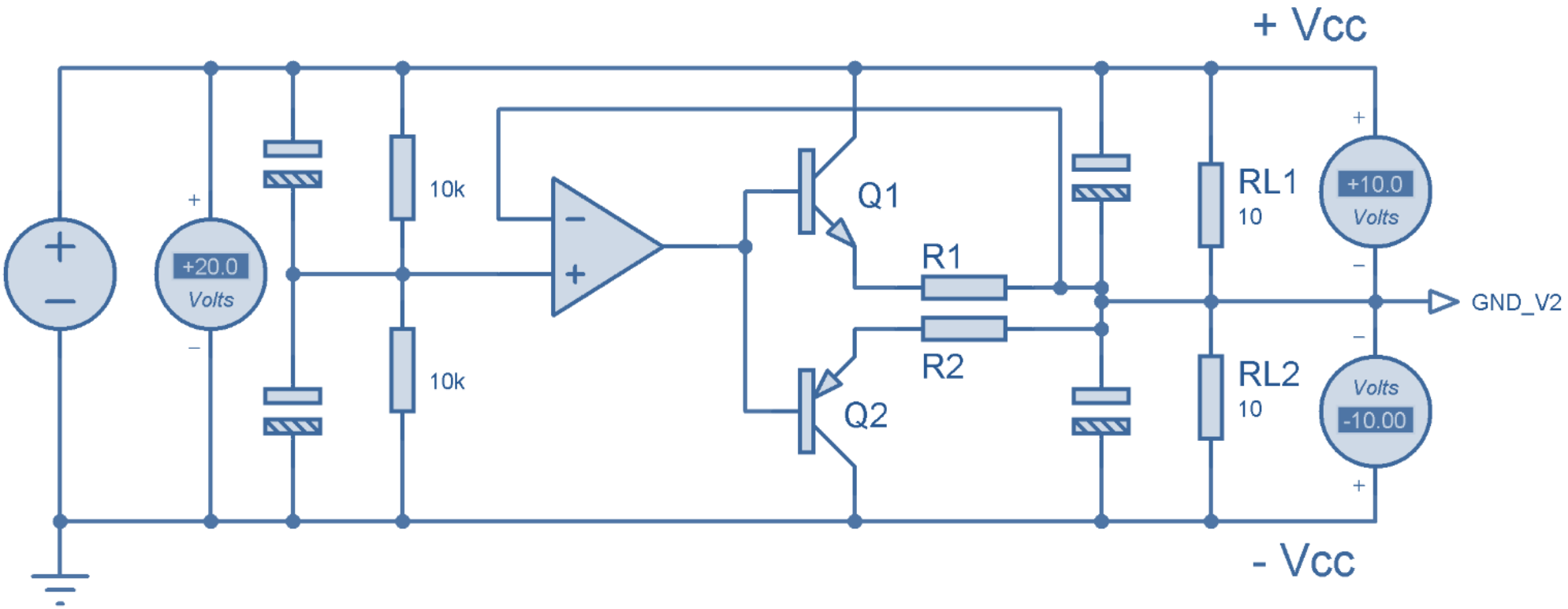

Vcc
R7
VR
C2
R8


Vcc
VR
VO1


Vcc
Vcc
Q2
R1
VR
R2
VO2
Q1

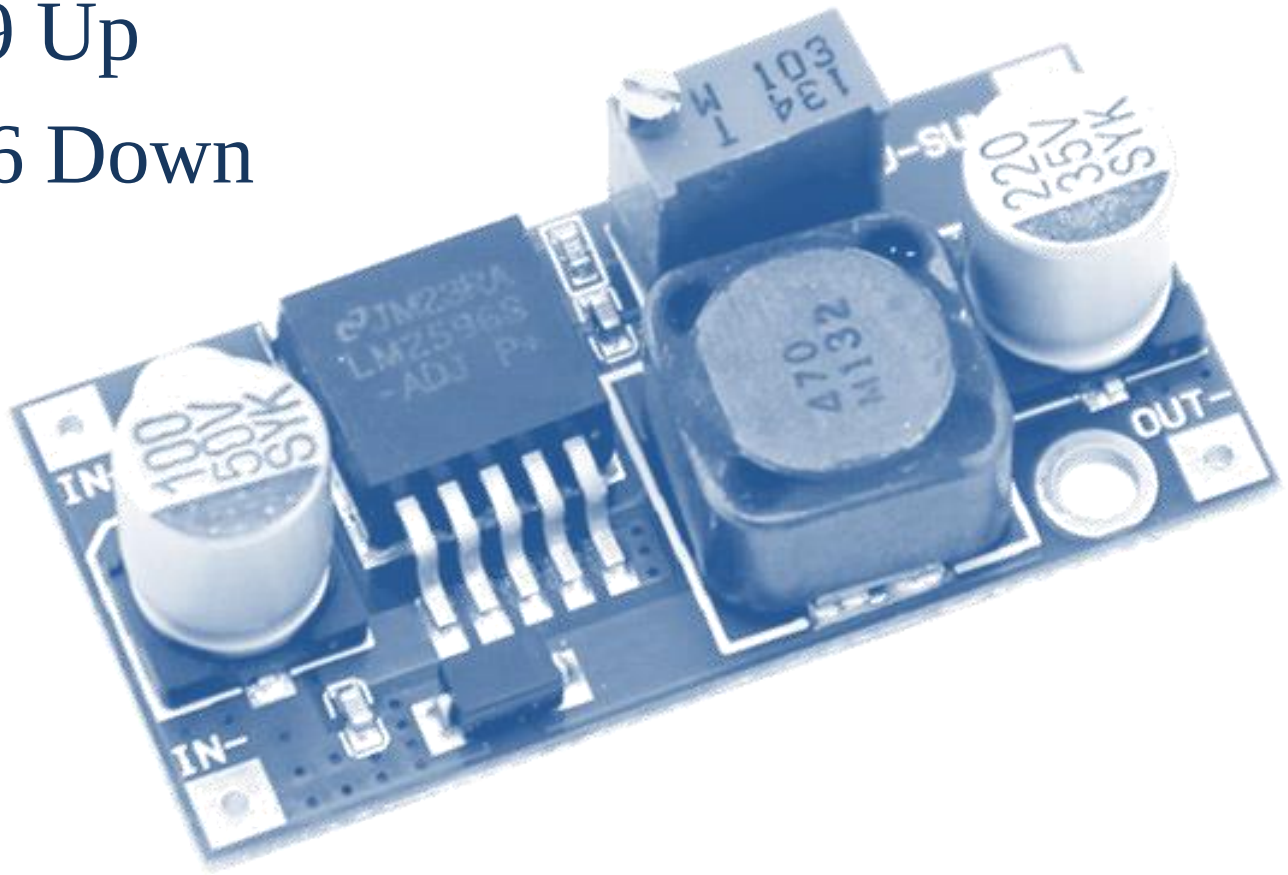

+ Vcc
+10.0
Volts
Volts
-10.0
- Vcc


+ Vcc
+20.0
Volts
1k
1k
+10.0
Volts
Volts
-10.00
GND_V1
- Vcc


+ Vcc
+20.0
Volts
10k
10k
Q1
Q2
R1
R2
RL1
10
RL2
10
+10.0
Volts
Volts
-10.00
GND_V2
- Vcc

CN6009 Up

LM2596 Down



Un sensor de Temperatura LM35, tiene una salida de 10mV/ºC, diseñe un arreglo que tenga 0V@20ºC y 5V@90ºC

Que margen de error tiene su diseño %?