







font



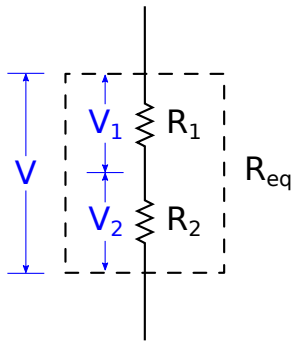




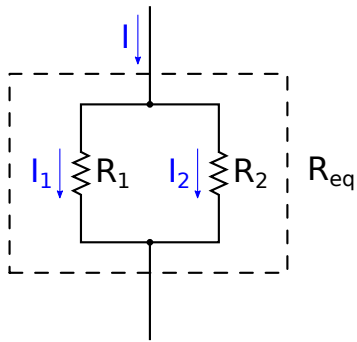




$$P_{\text{diss}} = I^2 R = \frac{V^2}{R}$$



Series
(a)

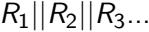


Parallel
(b)

BR

Repeal RI + RI + RI + .

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$







R_1 V  R_1 $+$ R_2



R_2

\checkmark



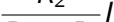
R_1

+

R_2



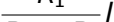
R_2



$R_1 + R_2$



R_1



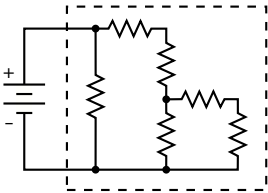
$R_1 + R_2$























Σ v_i $=$ 0

loop

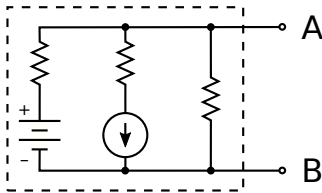


+	-
	
	

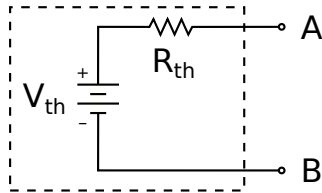
Σ

$$I_i = 0$$

junction



(a)



(b)



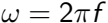




















$$X_C = - \frac{j}{\omega C}$$







$$\operatorname{Re}(V e^{j(\omega t + \phi_v)}) \equiv V \cos(\omega t + \phi_v)$$



$$\operatorname{Re}\left(e^{j(\omega t + \phi_i)}\right) = \cos(\omega t + \phi_i)$$















Revised 10/1/20

Revised



PLEASE VISIT [www.donors.org](#)

$$\langle P \rangle = \frac{V}{2} \cos(\phi_v - \phi_i) = \frac{V^2}{2} \cos(\phi_v - \phi_i)$$

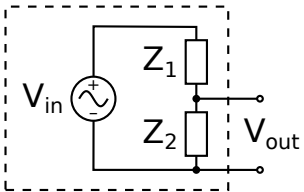
cos²wt



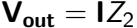








win 1200



$$v_{out} = \frac{z_2}{z_1 + z_2} v_{in}$$



v_{out}

$=$

$\sqrt{v_{out} * v_{out}}$



$$\tan \phi = \frac{\operatorname{Im} \left(\frac{Z_2}{Z_1 + Z_2} \right)}{\operatorname{Re} \left(\frac{Z_2}{Z_1 + Z_2} \right)}$$



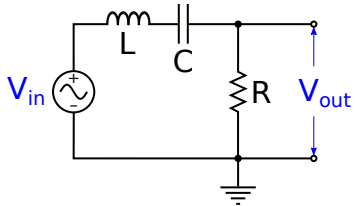
$$A_v = \frac{V_{out}}{V_{in}} = \frac{|V_{out}|}{|V_{in}|} = \left| \frac{Z_2}{Z_1 + Z_2} \right| = \sqrt{\left(\frac{Z_2}{Z_1 + Z_2} \right)^* \left(\frac{Z_2}{Z_1 + Z_2} \right)}$$



A_v

$=$

$\frac{1}{\sqrt{2}}$





$$Z_1 = j \left(\omega L - \frac{1}{\omega C} \right)$$

$$\frac{V_{out}}{V_{in}} = \sqrt{\frac{R^2}{R^2 + (\omega L - 1/\omega C)^2}}$$



$$\frac{Z_2}{Z_1 + Z_2} = \frac{R}{R + j\left(\omega L - \frac{1}{\omega C}\right)} = \frac{R^2 - jR\left(\omega L - \frac{1}{\omega C}\right)}{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

$$\tan \phi = \frac{\frac{1}{\omega C} - \omega L}{R}$$

voilà

Wavelength

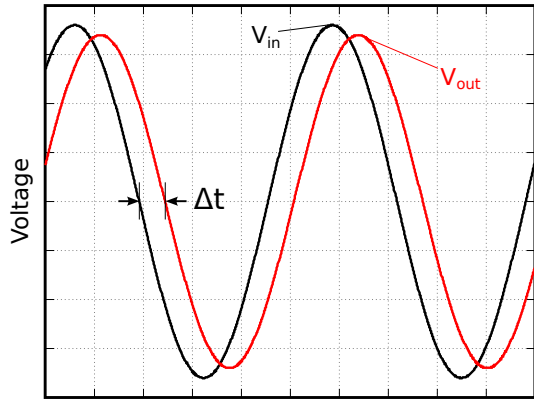


$$\Delta t = - \frac{\phi}{\omega} = - \frac{\phi}{2\pi f} = - \frac{\phi}{2\pi T}$$

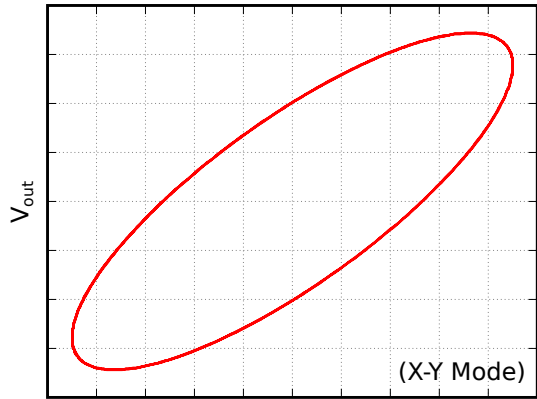


WAVE

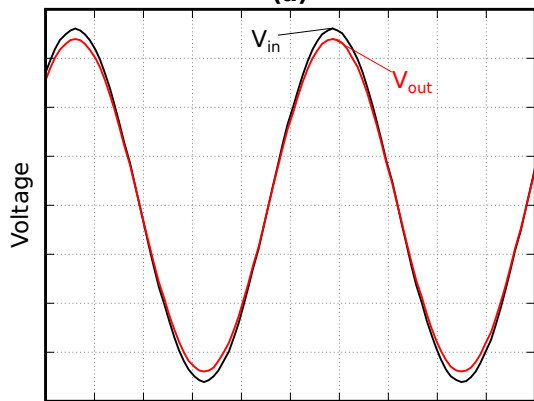




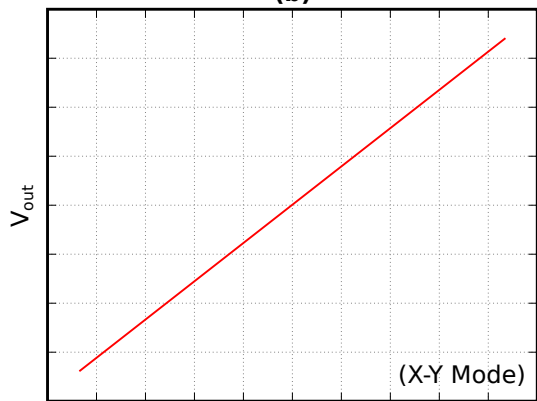
(a)



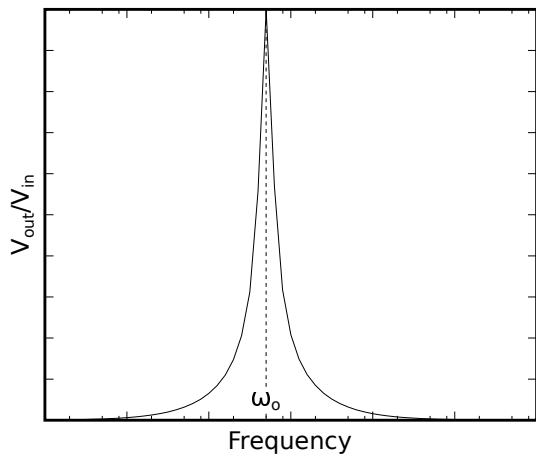
(b)



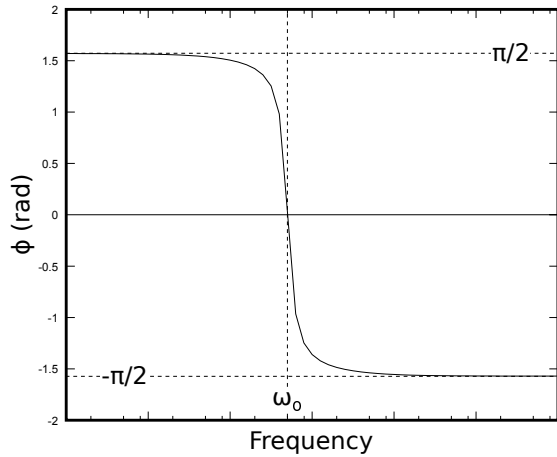
(c)



(d)



(a)



(b)

over

—

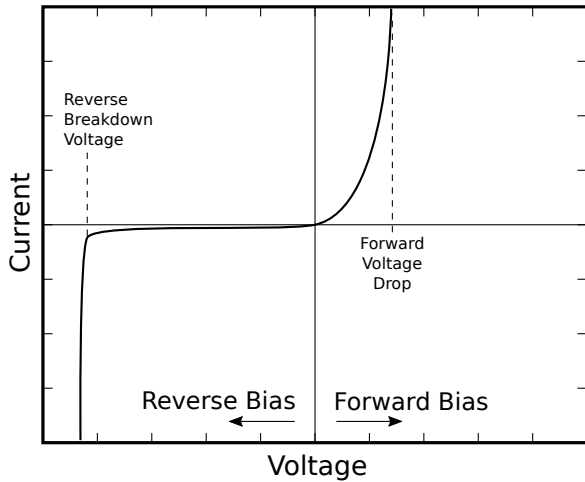
or





$$\omega_0 = \frac{1}{\sqrt{LC}}$$

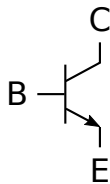






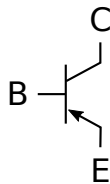






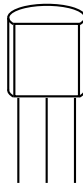
NPN

(a)



PNP

(b)



E B C

(c)



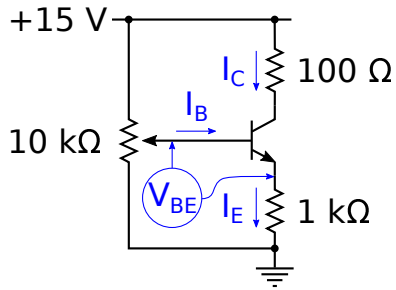


$$I_C = I_0 \left(e^{\frac{V_{BE}}{kT/e}} - 1 \right)$$



100% 100%

1930-20







$$r_e = \frac{dV_{BE}}{dI_C} = \frac{kT/e}{I_C}$$

Learn from the best



W E

SE

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SE





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3

4





WE ARE

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2

3

4

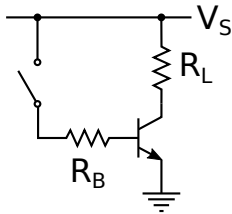
5



W E E E E E E E E E



es 25 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1













10

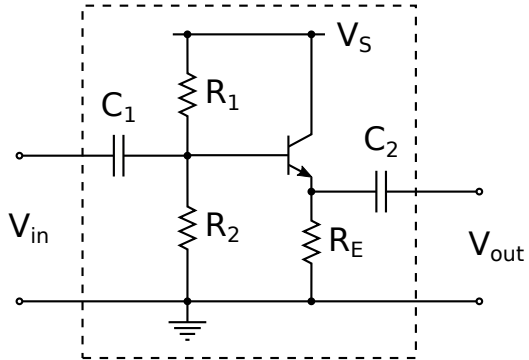
10

10

10

10

10









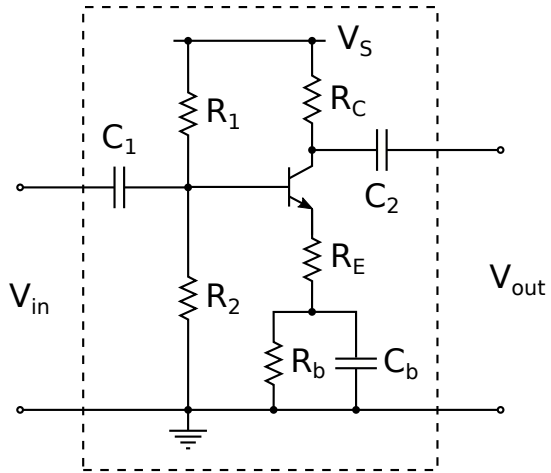


W E * O O W

APPRESENTATION







$$A_v = -\frac{R_C}{R_E}$$









2

Ab

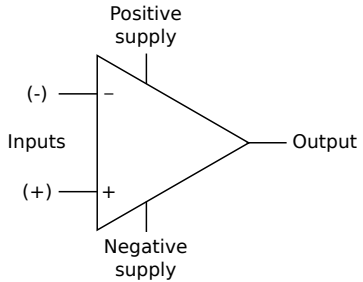
10



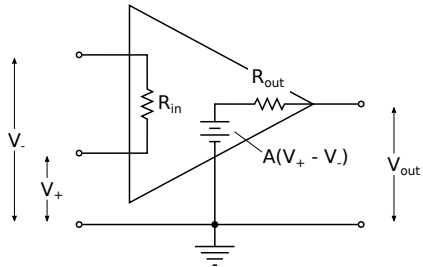
ARIZONA REFERENCE + ABILITY

RI 12

REAR + REAR



(a)



(b)



WAVE LOVE

100% **over** 100%







2020



1

0

9

1

0

5



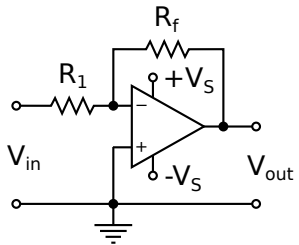
Rin = Oo Aa Oo , Roat = O

V + = V s
V s

Vol + Vol = Vol

A pixelated, black and white image of the text "Vovovovov". The letters are rendered in a simple, blocky font with a dithered or pixelated appearance. The text is centered horizontally and occupies most of the width of the image.







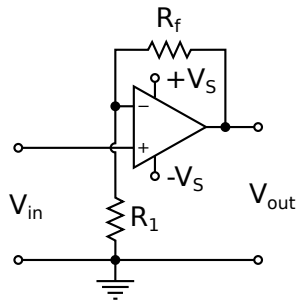
$$I = \frac{V_{in}}{R_1} = \frac{-V_{out}}{R_f}$$

$$A_v = -\frac{R_f}{R_1}$$





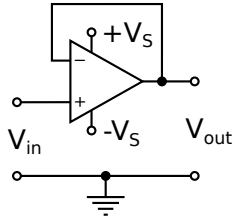




$$V_{in} = \frac{R_1}{R_1 + R_f} V_{out}$$

$$A_v = 1 + \frac{R_f}{R_1}$$

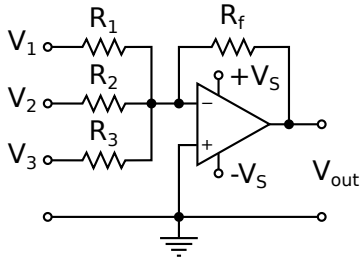
Real + Real











V1



R1

V2



R2



V3



R3



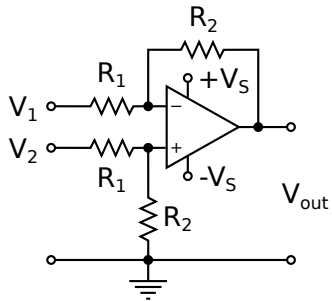
V_{out}

R_f



$$V_{out} = - \left(\frac{R_1}{R_f} V_1 + \frac{R_2}{R_f} V_2 + \frac{R_3}{R_f} V_3 \right)$$







V_1

—

V_L

R_1

V_2

$-$

V_+

R_1

$$V_L - V_{out}$$



$$R_2$$





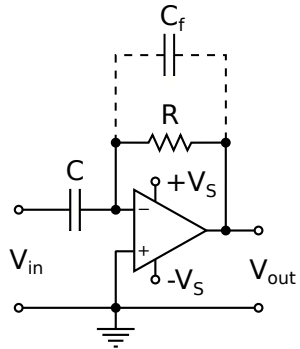
$$V_+ = \frac{R_2}{R_1 + R_2} V_2$$



$$V_{out} = -\frac{R_2}{R_1}(V_1 - V_2)$$













V_{in} $=$ $\frac{Q}{C}$

1

=

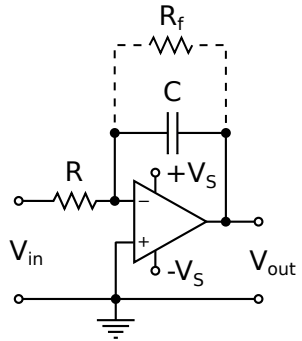
dQ

—

dt

$$V_{out} = -RC \frac{dV_{in}}{dt}$$





I

$=$

$$\frac{V_{in}}{R}$$

$$V_{out} = - \frac{Q}{C}$$

$$Q = \int dQ = \frac{1}{R} \int V_{in} dt + \text{constant}$$

$$v_{out} = -\frac{1}{RC} \int v_{in} dt + C$$



DC
Voltage
Source



Resistor



Capacitor



Inductor



DC
Current
Source



Potentiometer



Ground



Diode



AC
Source



NPN
Transistor



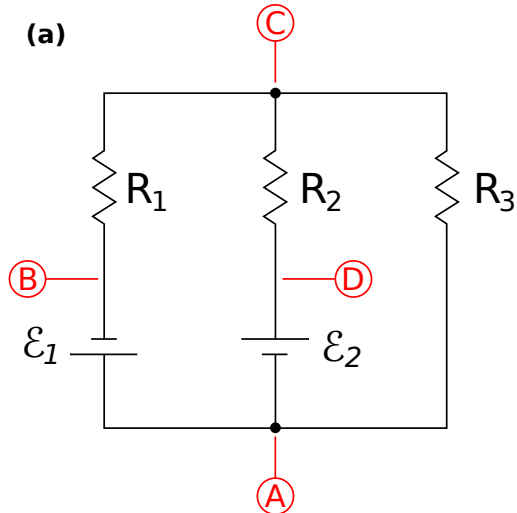
PNP
Transistor



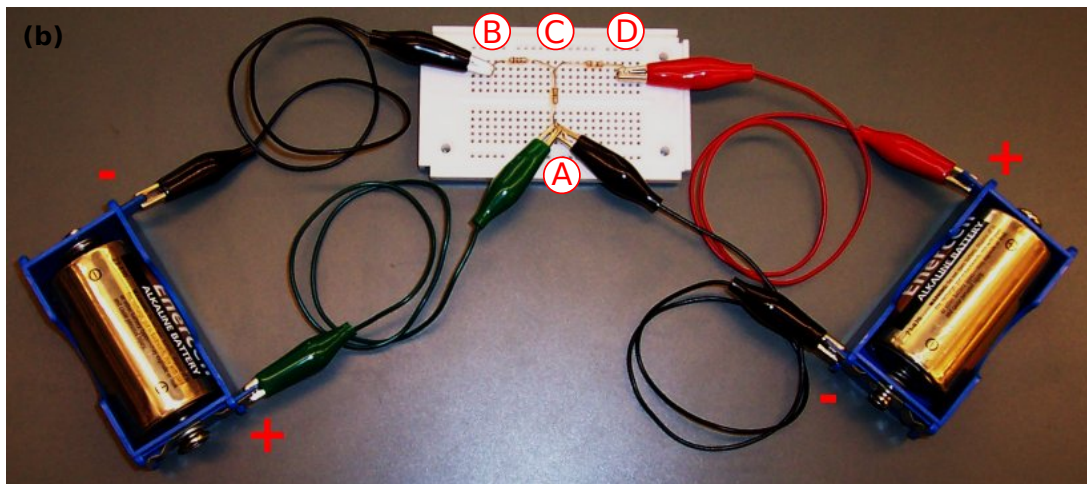
Op Amp

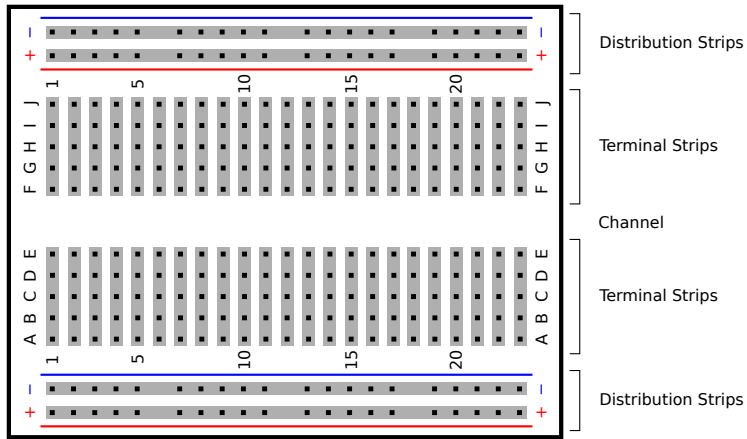


(a)



(b)



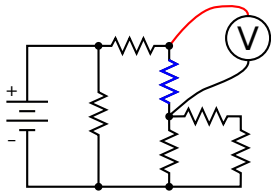


color	black	brown	red	orange	yellow	green	blue	violet	gray	white
digit	0	1	2	3	4	5	6	7	8	9
multiplier	1	10	100	1k	10k	100k	1M	10M	100M	1000M

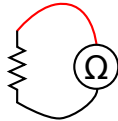
$$R = [\text{band1}][\text{band2}] \times 10^{[\text{band3}]} \quad \begin{array}{l} \pm 5\% \text{ (gold)} \\ \pm 10\% \text{ (silver)} \end{array}$$

$R = 64 \times 10^2$ $Q = 64 \times 10^2$

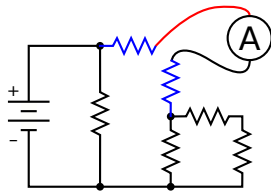




(a)



(b)



(c)

T H E N E W S

T H N O E

$$dB = 10 \log \left(\frac{\text{Thing}_2}{\text{Thing}_1} \right)$$

Thinner



Therapy





$$10 \log \left(\frac{P_{out}}{P_{in}} \right) = 10 \log \left(\frac{1}{2} \right) = 10(-0.3010) = -3.01$$

Avantgarde



