

Frequency, period	$f = \frac{1}{T}$
Ohm's Law	$V = IR, I = \frac{V}{R}, R = \frac{V}{I}$
Power	$P = VI, P = I^2R, P = \frac{V^2}{R}$
Current	$I = \frac{P}{V}, I = \sqrt{\frac{P}{R}}$
Voltage	$V = \sqrt{PR} \quad V = \frac{P}{I}$
Resistance	$R = \frac{P}{I^2}, R = \frac{V^2}{P}$
Resistors in series	$R_T = R_1 + R_2 + R_3 + \dots$
Resistors in parallel	$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$ or $R_T = (R_1^{-1} + R_2^{-1} + R_3^{-1} + \dots)^{-1}$
Capacitors in series	$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$ or $C_T = (C_1^{-1} + C_2^{-1} + C_3^{-1} + \dots)^{-1}$
Capacitors in parallel	$C_T = C_1 + C_2 + C_3 + \dots$
Inductive reactance	$X_L = 2\pi f L$
Capacitive reactance	$X_C = \frac{1}{2\pi f C}$
RC filter cut off frequency	$f_c = \frac{1}{2\pi RC}$
Impedance	$Z_T = \sqrt{R^2 + X^2}, X = X_L - X_C$
LC filter resonance	$f = \frac{1}{2\pi \sqrt{LC}}, C = \frac{1}{L} \left( \frac{1}{2\pi f} \right)^2, L = \frac{1}{C} \left( \frac{1}{2\pi f} \right)^2$
RC time constant	$T = RC$
RL time constant	$T = \frac{L}{R}$
Gain	

negative gain for an inverting amplifier

$$G = \frac{-V_{out}}{V_{in}} \text{ or } -G = \frac{R_f}{R_{in}}$$

for a non-inverting amplifier

$$G = \frac{V_{out}}{V_{in}} \text{ or } G = 1 + \frac{R_f}{R_{in}} \text{ or } G = \frac{R_f + R_{in}}{R_{in}}$$

Summing Amplifier Gain

$$\frac{-V_{out}}{R_f} = \frac{V_{in1}}{R_{in1}} + \frac{V_{in2}}{R_{in2}} + \frac{V_{in3}}{R_{in3}} \text{ or } V_{out} = -R_f \left( \frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3} \right)$$

Power Gain(dB)

$$G = 10 \log \frac{P_{out}}{P_{in}} \text{ or } 20 \log \frac{V_{out}}{V_{in}} \text{ (provided } Z_{in} = Z_{load})$$

Peak voltage

$$V_{peak} = 1.414 V_{RMS} \text{ RMS voltage} \quad V_{RMS} = 0.707 V_{peak}$$

Voltage divider

$$V_{out} = \frac{R_2}{R_1 + R_2} \cdot V_{in}$$

Resistor colour code

Capacitor value code

Colour	digit	multiplier	tolerance
Silver		x 0.01	±10%
Gold		x 0.1	±5%
Black	0	x 1	
Brown	1	x 10	±1%
Red	2	x 100	±2%
Orange	3	x 1000	±3%
Yellow	4	x 10000	±4%
Green	5	x 100000	±0.5%
Blue	6	x 1000000	±0.25%
Violet	7		
Grey	8		
White	9		








First two numerals represent first two digits of capacitor's value, in picofarads  
Third numeral represents multiplier (power of 10)

e.g.  
1000 pF has code 102  
10 nF = 10,000 pF has code 103  
2.2µF = 2,200,000 pF has code 225

E12 Values

10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82

Logic gates

AND		OR		XOR	
NAND		NOR		XNOR	
NOT					

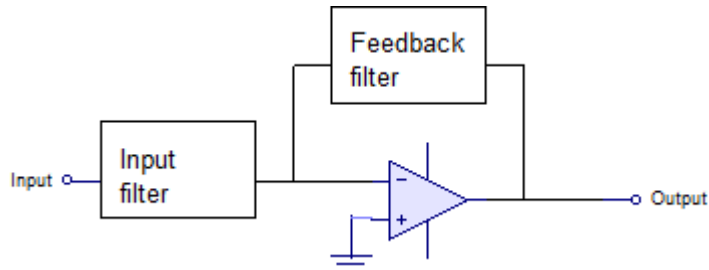
Clock Inputs



## Passive Filters

	Low Pass	High Pass	Band Pass	Band Stop (Notch)
RC				
RL				
LC				

## Active Filters



Only one input or feedback filter required, but will work with both. Input or feedback filter is passive filter as above.