ETA Common Formulas

Conversion Factors:

π **(Pi) = 3.14** $\quad$ $2\pi = 6.28$

$\pi^2 = 9.87$ $\quad$ $\log\pi = 0.497$

1 meter = 3.28 feet

1 inch = 2.54 centimeters

1 radian = 57.3°

Resonant frequency formulas

Where f is in kHz, L is in microhenries, C is in microfarads

$$f_{kHz} = 159.2 \div \sqrt{LC}$$

$$f_{resonant} = \frac{1}{2\pi\sqrt{LC}}$$

Frequency & Wavelength formulas $\quad$ ***f = frequency, λ = wavelength***

$0.5\lambda = 180° =$ half wave $\quad 0.25\lambda = 90° =$ quarter wave

$$f_{kHz} = (3\times10^8) \div \lambda\text{meters} \quad \text{or} \quad f_{MHz} = 984 \div \lambda\text{feet}$$

$$\lambda\text{meters} = (3\times10^8) \div f_{kHz} \quad \text{or} \quad \lambda\text{feet} = 984 \div f_{MHz}$$

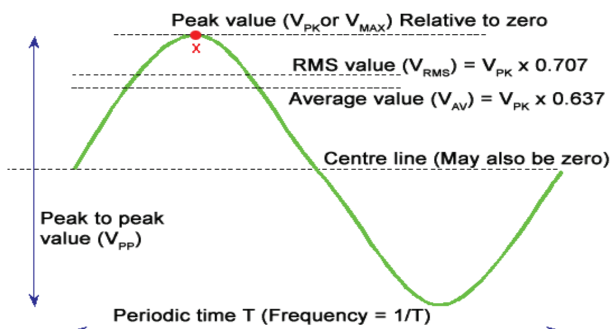
Sine wave conversion $\quad$ (RMS = root mean square).

Effective value (RMS) = 0.707 x Peak Value = 1.11 x Average Value

Peak Value = 1.414 x Effective Value (RMS) = 1.57 x Average Value

Average Value = 0.637 x Peak Value = 0.9 x Effective Value (RMS)

Identify: Waveform, Peak (amplitude), RMS, 1 cycle over time period (frequency), Peak to peak, and practical average.



Voltage gain in decibels

$$\text{Gain dB} = 20 \log (V_{out} / V_{in})$$

Ratio of 2 power levels in decibels

$$\text{Gain dB} = 10 \log (P_1 \div P_2)$$

Resistors in series

$$R = R_1 + R_2 + R_3 ...$$

Resistors in parallel

$$1 / R = (1 / R_1) + (1 / R_2) + (1 / R_3)...$$

Inductors connected in series

$$L = L_1 + L_2 + L_3 + ...$$

Inductors connected in parallel

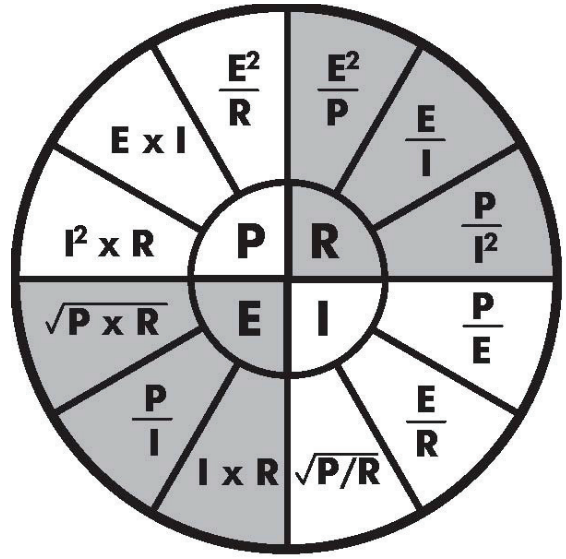
$$1 \div L = (1 \div L_1) + (1 \div L_2)...$$

Reactance of inductors

where X_L is reactance, f is frequency, and **L** is inductance

$$X_L = 2 \times \pi \times f \times L$$

Ohm's Law



E=Voltage I=Current
P=Power R=Resistance

P = I * E, the power being dissipated by the resistor is a product of the current and the applied voltage.

Time constants

T (Greek Tau), R (ohms), C (microfarads), L (microhenries)

RL circuit: **1 T (sec) = L** (μH) ÷ **R** (Ω)

RC circuit: **1 T (sec) = R** (Ω) × **C** (μf)

How to Compute Charge or Quantity of Electricity

where **Q** is the charge (in coulombs), **C** is the capacitance (in farads), and **V** is the potential difference (in volts).

$$Q = C \times V$$

Energy Storage in a Capacitor

where **W** is the energy (in Joules), **C** is the capacitance (in farads), and **V** is the potential difference (in volts).

$$W = \tfrac{1}{2} C \times V^2$$

Capacitors connected in parallel

$$C = C_1 + C_2 + C_3 + ...$$

Capacitors connected in series

$$1 \div C = (1 \div C_1) + (1 \div C_2) + (1 \div C_3)...$$

Reactance of capacitors

$$X_C = 1 \div (2 \times \pi \times f \times C)$$

Impedance Formulas $\quad$ for a Series Circuit

$$Z = \sqrt{R^2 + (X_L - X_C)^2} \quad \text{where Z is impedance}$$

Impedance Formulas $\quad$ for R and X in Parallel

$$Z = \frac{RX}{\sqrt{R^2 + X^2}}$$

Battery internal resistance

$$V_{out} = EMF - V_{terminal}$$