Important Power Filters Formulas PDF

Formulas

Examples

with Units

List of 15
Important Power Filters Formulas

1) Amplitude of Active Power Filter Formula

Evaluate Formula

Formula

$$\xi = \frac{V_{dc}}{2 \cdot K_s}$$

Example with Units

$$1.1091\,\text{v} = \frac{12\,\text{v}}{2 \cdot 5.41}$$

2) Angular Resonant Frequency of Passive Filter Formula

Evaluate Formula

Formula

$$\omega_n = \frac{R \cdot Q}{L}$$

Example with Units

$$24.9823\,\text{rad/s} = \frac{149.9\,\Omega \cdot 8.333}{50\,\text{H}}$$

3) Corner Frequency in Bandpass Filter for Series RLC Circuit Formula

Evaluate Formula

Formula

$$f_c = \left(\frac{R}{2 \cdot L} \right) + \left(\sqrt{ \left(\frac{R}{2 \cdot L} \right)^2 + \frac{1}{L \cdot C} } \right)$$

Example with Units

$$2.9981\,\text{Hz} = \left(\frac{149.9\,\Omega}{2 \cdot 50\,\text{H}} \right) + \left(\sqrt{ \left(\frac{149.9\,\Omega}{2 \cdot 50\,\text{H}} \right)^2 + \frac{1}{50\,\text{H} \cdot 80\,\text{F}} } \right)$$

4) Cut-off Frequency in Bandpass Filter for Parallel RLC Circuit Formula ➥

Formula

$$\omega_c = \left(\frac{1}{2 \cdot R \cdot C} \right) + \left(\sqrt{ \left(\frac{1}{2 \cdot R \cdot C} \right)^2 + \frac{1}{L \cdot C} } \right)$$

Example with Units

$$0.0159\,_{Hz} = \left(\frac{1}{2 \cdot 149.9\,_\Omega \cdot 80\,_F} \right) + \left(\sqrt{ \left(\frac{1}{2 \cdot 149.9\,_\Omega \cdot 80\,_F} \right)^2 + \frac{1}{50\,_H \cdot 80\,_F} } \right)$$

5) Gain of Active Power Filter Formula ➥

Formula

$$K = \frac{V_{ch}}{i_{sh}}$$

Example

$$0.4615 = \frac{30}{65}$$

6) Gain of Converter of Active Power Filter Formula ➥

Formula

$$K_s = \frac{V_{dc}}{2 \cdot \xi}$$

Example with Units

$$5.4103 = \frac{12\,_V}{2 \cdot 1.109\,_V}$$

7) Keying Index of Parallel RLC Bandpass Filter Formula ➥

Formula

$$k_i' = \omega_c \cdot k_p'$$

Example with Units

$$0.0012 = 0.015\,_{Hz} \cdot 0.078$$

8) Keying Parameter of Parallel RLC Bandpass Filter Formula ➥

Formula

$$k_p' = \frac{(L + L_o) \cdot \omega_c}{2 \cdot V_{dc}}$$

Example with Units

$$0.0788 = \frac{(50\,_H + 76\,_H) \cdot 0.015\,_{Hz}}{2 \cdot 12\,_V}$$

9) Phase Angle of Low Pass RC Filter Formula ➥

Formula

$$\theta = 2 \cdot \arctan(2 \cdot \pi \cdot f \cdot R \cdot C)$$

Example with Units

$$180° = 2 \cdot \arctan(2 \cdot 3.1416 \cdot 60\,_{Hz} \cdot 149.9\,_\Omega \cdot 80\,_F)$$

10) Quality Factor of Passive Filter Formula 📤

Formula

$$Q = \frac{\omega_n \cdot L}{R}$$

Example with Units

$$8.3322 = \frac{24.98\,\text{rad/s} \cdot 50\,\text{H}}{149.9\,\Omega}$$

11) Resistance of Passive Filter Formula 📤

Formula

$$R = \frac{\omega_n \cdot L}{Q}$$

Example with Units

$$149.886\,\Omega = \frac{24.98\,\text{rad/s} \cdot 50\,\text{H}}{8.333}$$

12) Resonant Frequency of Passive Filter Formula 📤

Formula

$$f_r = \frac{1}{2 \cdot \pi \cdot \sqrt{L \cdot C}}$$

Example with Units

$$0.0025\,\text{Hz} = \frac{1}{2 \cdot 3.1416 \cdot \sqrt{50\,\text{H} \cdot 80\,\text{F}}}$$

13) Slope of Triangular Waveform of Active Power Filter Formula 📤

Formula

$$\lambda = 4 \cdot \xi \cdot f_t$$

Example with Units

$$0.3549 = 4 \cdot 1.109\,\text{v} \cdot 0.08\,\text{Hz}$$

14) Tuned Factor of Hybrid Filter Formula 📤

Formula

$$\delta = \frac{\omega - \omega_n}{\omega_n}$$

Example with Units

$$0.281 = \frac{32\,\text{rad/s} - 24.98\,\text{rad/s}}{24.98\,\text{rad/s}}$$

15) Voltage across Passive Filter Capacitor Formula 📤

Formula

$$V_c = \beta \cdot V_t$$

Example with Units

$$126\,\text{v} = 18 \cdot 7\,\text{v}$$

Variables used in list of Power Filters Formulas above

- C Capacitance *(Farad)*
- f Frequency *(Hertz)*
- f_c Corner Frequency *(Hertz)*
- f_r Resonant Frequency *(Hertz)*
- f_t Triangular Waveform Frequency *(Hertz)*
- i_{sh} Harmonic Current Component
- K Active Power Filter Gain
- k_i' Keying Index
- k_p' Keying Parameter
- K_s Gain of Converter
- L Inductance *(Henry)*
- L_o Leakage Inductance *(Henry)*
- Q Quality Factor
- R Resistance *(Ohm)*
- V_c Voltage across Passive Filter Capacitor *(Volt)*
- V_{ch} Voltage Harmonic Waveform
- V_{dc} DC Voltage *(Volt)*
- V_t Fundamental Frequency Component *(Volt)*
- β Filter Transfer Function
- δ Tuned Factor
- θ Phase Angle *(Degree)*
- λ Triangular Waveform Slope
- ξ Triangular Waveform Amplitude *(Volt)*
- ω Angular Frequency *(Radian per Second)*
- ω_c Cutoff Frequency *(Hertz)*
- ω_n Angular Resonant Frequency *(Radian per Second)*

Constants, Functions, Measurements used in list of Power Filters Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **arctan**, arctan(Number) *Inverse trigonometric functions are usually accompanied by the prefix - arc. Mathematically, we represent arctan or the inverse tangent function as tan-1 x or arctan(x).*
- Functions: **ctan**, ctan(Angle) *Cotangent is a trigonometric function that is defined as the ratio of the adjacent side to the opposite side in a right triangle.*
- Functions: **sqrt**, sqrt(Number) *A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.*
- Functions: **tan**, tan(Angle) *The tangent of an angle is a trigonometric ratio of the length of the side opposite an angle to the length of the side adjacent to an angle in a right triangle.*
- Measurement: **Angle** in Degree (°) *Angle Unit Conversion* ➦
- Measurement: **Frequency** in Hertz (Hz) *Frequency Unit Conversion* ➦
- Measurement: **Capacitance** in Farad (F) *Capacitance Unit Conversion* ➦
- Measurement: **Electric Resistance** in Ohm (Ω) *Electric Resistance Unit Conversion* ➦
- Measurement: **Inductance** in Henry (H) *Inductance Unit Conversion* ➦
- Measurement: **Electric Potential** in Volt (V) *Electric Potential Unit Conversion* ➦
- Measurement: **Angular Frequency** in Radian per Second (rad/s) *Angular Frequency Unit Conversion* ➦

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