

Important Transmission Line Characteristics Formulas PDF



Formulas Examples with Units

List of 15 Important Transmission Line Characteristics Formulas

1) Bandwidth of Antenna Formula ↻

Formula

$$BW = 100 \cdot \left(\frac{F_H - f_L}{F_c} \right)$$

Example with Units

$$18.76 \text{ kHz} = 100 \cdot \left(\frac{500 \text{ kHz} - 31 \text{ kHz}}{2.5 \text{ kHz}} \right)$$

Evaluate Formula ↻

2) Characteristic Impedance of Transmission Line Formula ↻

Formula

$$Z_o = \sqrt{\frac{L}{C}}$$

Example with Units

$$19.8068 \Omega = \sqrt{\frac{5.1 \text{ mH}}{13 \mu\text{F}}}$$

Evaluate Formula ↻

3) Conductance of Distortionless Line Formula ↻

Formula

$$G = \frac{R \cdot C}{L}$$

Example with Units

$$0.0325 \text{ S} = \frac{12.75 \Omega \cdot 13 \mu\text{F}}{5.1 \text{ mH}}$$

Evaluate Formula ↻

4) Current Standing Wave Ratio (CSWR) Formula ↻

Formula

$$CSWR = \frac{i_{\max}}{i_{\min}}$$

Example with Units

$$1.931 = \frac{5.6 \text{ A}}{2.9 \text{ A}}$$

Evaluate Formula ↻

5) Impedance Matching in Single Section Quarter Wave Line Formula ↻

Formula

$$Z_o = \sqrt{Z_L \cdot Z_s}$$

Example with Units

$$19.8081 \Omega = \sqrt{68 \Omega \cdot 5.77 \Omega}$$

Evaluate Formula ↻



6) Insertion Loss in Transmission Line Formula ↻

Formula

$$I_L = 10 \cdot \log_{10} \left(\frac{P_t}{P_r} \right)$$

Example with Units

$$5.0931 \text{ dB} = 10 \cdot \log_{10} \left(\frac{0.42 \text{ W}}{0.13 \text{ W}} \right)$$

Evaluate Formula ↻

7) Length of Wound Conductor Formula ↻

Formula

$$L_{\text{cond}} = \sqrt{1 + \left(\frac{\pi}{P_{\text{cond}}} \right)^2}$$

Example with Units

$$2.5815 \text{ m} = \sqrt{1 + \left(\frac{3.1416}{1.32} \right)^2}$$

Evaluate Formula ↻

8) Phase Velocity in Transmission Lines Formula ↻

Formula

$$V_p = \lambda \cdot f$$

Example with Units

$$1950 \text{ m/s} = 7.8 \text{ m} \cdot 0.25 \text{ kHz}$$

Evaluate Formula ↻

9) Reflection Coefficient in Transmission Line Formula ↻

Formula

$$\Gamma = \frac{Z_L - Z_0}{Z_L + Z_0}$$

Example with Units

$$0.549 = \frac{68 \Omega - 19.8 \Omega}{68 \Omega + 19.8 \Omega}$$

Evaluate Formula ↻

10) Relative Pitch of Wound Conductor Formula ↻

Formula

$$P_{\text{cond}} = \left(\frac{L_s}{2 \cdot r_{\text{layer}}} \right)$$

Example with Units

$$1.3289 = \left(\frac{8 \text{ m}}{2 \cdot 3.01 \text{ m}} \right)$$

Evaluate Formula ↻

11) Resistance at Second Temperature Formula ↻

Formula

$$R_2 = R_1 \cdot \left(\frac{T + T_f}{T + T_0} \right)$$

Example with Units

$$2.4318 \Omega = 3.99 \Omega \cdot \left(\frac{243 \text{ K} + 27 \text{ K}}{243 \text{ K} + 200 \text{ K}} \right)$$

Evaluate Formula ↻

12) Return Loss by Means of VSWR Formula ↻

Formula

$$P_{\text{ret}} = 20 \cdot \log_{10} \left(\frac{\text{VSWR} + 1}{\text{VSWR} - 1} \right)$$

Example with Units

$$5.3655 \text{ dB} = 20 \cdot \log_{10} \left(\frac{3.34 + 1}{3.34 - 1} \right)$$

Evaluate Formula ↻



13) Standing Wave Ratio Formula

Formula

$$SWR = \frac{V_{\max}}{V_{\min}}$$

Example with Units

$$7 = \frac{10.5\text{ v}}{1.5\text{ v}}$$

Evaluate Formula 

14) Voltage Standing Wave Ratio (VSWR) Formula

Formula

$$VSWR = \frac{1 + \Gamma}{1 - \Gamma}$$

Example

$$3.3478 = \frac{1 + 0.54}{1 - 0.54}$$

Evaluate Formula 

15) Wavelength of Line Formula

Formula

$$\lambda = \frac{2 \cdot \pi}{\beta}$$

Example with Units

$$7.854\text{ m} = \frac{2 \cdot 3.1416}{0.8}$$

Evaluate Formula 



Variables used in list of Transmission Line Characteristics Formulas above

- **BW** Bandwidth of Antenna (Kilohertz)
- **C** Capacitance (Microfarad)
- **CSWR** Current Standing Wave Ratio
- **f** Frequency (Kilohertz)
- **F_c** Centre Frequency (Kilohertz)
- **F_H** Highest Frequency (Kilohertz)
- **f_L** Lowest Frequency (Kilohertz)
- **G** Conductance (Mho)
- **I_L** Insertion Loss (Decibel)
- **i_{max}** Current Maxima (Ampere)
- **i_{min}** Current Minima (Ampere)
- **L** Inductance (Millihenry)
- **L_{cond}** Length of Wound Conductor (Meter)
- **L_s** Length of Spiral (Meter)
- **P_{cond}** Relative Pitch of Wound Conductor
- **P_r** Power Received After Insertion (Watt)
- **P_{ret}** Return Loss (Decibel)
- **P_t** Power Transmitted Before Insertion (Watt)
- **R** Resistance (Ohm)
- **R₁** Initial Resistance (Ohm)
- **R₂** Final Resistance (Ohm)
- **r_{layer}** Radius of Layer (Meter)
- **SWR** Standing Wave Ratio (SWR)
- **T** Temperature Coefficient (Kelvin)
- **T_f** Final Temperature (Kelvin)
- **T_o** Initial Temperature (Kelvin)
- **V_{max}** Voltage Maxima (Volt)
- **V_{min}** Voltage Minima (Volt)
- **V_p** Phase Velocity (Meter per Second)
- **VSWR** Voltage Standing Wave Ratio
- **Z_L** Load Impedance of Transmission Line (Ohm)

Constants, Functions, Measurements used in list of Transmission Line Characteristics Formulas above

- **constant(s):** pi,
3.14159265358979323846264338327950288
Archimedes' constant
- **Functions:** log10, log10(Number)
The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- **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.
- **Measurement:** Length in Meter (m)
Length Unit Conversion 
- **Measurement:** Electric Current in Ampere (A)
Electric Current Unit Conversion 
- **Measurement:** Temperature in Kelvin (K)
Temperature Unit Conversion 
- **Measurement:** Speed in Meter per Second (m/s)
Speed Unit Conversion 
- **Measurement:** Power in Watt (W)
Power Unit Conversion 
- **Measurement:** Noise in Decibel (dB)
Noise Unit Conversion 
- **Measurement:** Frequency in Kilohertz (kHz)
Frequency Unit Conversion 
- **Measurement:** Capacitance in Microfarad (μF)
Capacitance Unit Conversion 
- **Measurement:** Electric Resistance in Ohm (Ω)
Electric Resistance Unit Conversion 
- **Measurement:** Electric Conductance in Mho (Ω)
Electric Conductance Unit Conversion 
- **Measurement:** Inductance in Millihenry (mH)
Inductance Unit Conversion 
- **Measurement:** Wavelength in Meter (m)
Wavelength Unit Conversion 
- **Measurement:** Electric Potential in Volt (V)
Electric Potential Unit Conversion 



- Z_0 Characteristics Impedance of Transmission Line (*Ohm*)
- Z_s Source Impedance (*Ohm*)
- β Propagation Constant
- Γ Reflection Coefficient
- λ Wavelength (*Meter*)



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