RF/MICROWAVE SOFTWARE AND DESIGN

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FILL IN THE MISSING VARIABLE IN THE PINK SHADED BOX.

Z_0 CHARACTERISTIC IMPEDANCE [Ω]

The characteristic impedance is the resistance initially seen when a signal is applied to the line. It is a physical characteristic resulting from the materials and geometry of the line.

Lossless line:

$$Z_0 = \sqrt{\frac{\square}{C}} = \frac{V_+}{I_+} = -\frac{V_-}{I_-}$$

δ SKIN DEPTH [CM]

The depth into a material at which a wave is attenuated by 1/e (about 36.8%) of its original intensity. This is not the same δ that appears in the loss tangent, tan δ.

$$\delta = \frac{1}{\alpha} = \sqrt{\frac{2}{\omega \square \sigma}}$$

TAN δ LOSS TANGENT

The loss tangent, a value between 0 and 1, is the loss coefficient of a wave after it has traveled one wavelength. This is the way data is usually presented in texts.

$$\tan\delta = \frac{\square}{\omega\varepsilon}$$

V_p VELOCITY OF PROPAGATION [CM/S]

The velocity of propagation is the speed at which a wave moves down a transmission line. The velocity approaches the speed of light but may not exceed the speed of light since this is the maximum speed at which information can be transmitted.

$$v_p = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{\square \mu}} = \frac{\omega}{\beta}$$

ρ REFLECTION COEFFICIENT

The reflection coefficient is the ratio of reflected voltage to the forward-traveling voltage, a value ranging from –1 to +1 which, when multiplied by the wave voltage, determines the amount of voltage reflected at one end of the transmission line.

$$\rho = \frac{V_-}{V_+} = -\frac{\square}{I_+}$$