www.mo-rep.com

MIDWIN & OURSON

2001 S Barrington Ave,
Suite 120,
Los Angeles, California 90025-5337
806-304-9098

EQUATIONS

Transmission Line Relationships

$$Z_{in} = Z_o \frac{Z_l + jZ_o \tan\theta}{Z_o + jZ_l \tan\theta}$$

Where: $Z_0 = characteristic\ impedance$
$Z_1 = load\ impedance$

$$\lambda_{(inches)} = \frac{11.803}{frequency(GHz)}$$

Where: $\lambda = wavelength$

$$\lambda_g = \frac{\lambda_o}{\sqrt{1-(\lambda_o / 2a)^2}}$$

Where: $\lambda_g = guide\ wavelength$
$\lambda_o = free\ space\ wavelength$
$a = width\ of\ waveguide$

For a coaxial line:

$$Z_o = \frac{59.96}{\sqrt{\in_r}} \bullet \ln\frac{b}{a}$$

Where: $b = outer\ diameter$
$a = inner\ diameter$
$\in_r = relative\ diecectric\ const\ ant$

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

Where: $|\Gamma| = magnitude\ of\ voltage\ reflection\ coefficient$

$$|\Gamma| = \frac{Z_l - Z_o}{Z_l + Z_o}$$

$$\frac{P_r}{P_i} = |\Gamma|^2 = \left(\frac{VSWR-1}{VSWR+1}\right)^2$$

Where: $P_i = incident\ power$
$P_r = reflected\ power$
$P_t = transmitted\ power$

$$\frac{P_t}{P_i} = 1 - |\Gamma|^2 = \frac{4VSWR}{(VSWR+1)^2}$$

www.mo-rep.com

Midwin & Ourson

2001 S Barrington Ave,
Suite 120,
Los Angeles, California 90025-5337
806-304-9098

EQUATIONS

2nd Stage Noise Figure Contribution

$$f_t = f_1 + \frac{f_2 - 1}{g_1}$$

Where: $f_t = total\ noise\ figure$
$f_1 = first\ stage\ noise\ figure$
$f_2 = second\ stage\ noise\ figure$
$g_1 = first\ stage\ gain$

Rise Time

$$T_r = 2.2\mathrm{T} = \frac{.35}{BW}$$

Where: $T_r = rise\ time$
$\mathrm{T} = time\ constant$
$BW = 3dB\ bandwidth$

Price Learning Curve

$$\frac{P_2}{P_1} = \left[\frac{\%LearningCurve}{100}\right]^{\frac{\ln(Q_2/Q_1)}{\ln 2}}$$

Where: $\ln = natural\ \log$
$P_1 = price\ at\ lower\ quantity$
$P_2 = price\ at\ higher\ quantity$
$Q_1 = lower\ quantity$
$Q_2 = higher\ quantity$