

$$\beta = \omega\sqrt{\mu\varepsilon} = \frac{2\pi}{\lambda}$$

$$Z_0 = \frac{d}{w}\sqrt{\frac{\mu}{\varepsilon}} \quad \text{Microstrip Line}$$

$$Z_i = Z_0 \frac{Z_L + jZ_0 \tan(\beta l)}{Z_0 + jZ_L \tan(\beta l)}$$

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

$$Z_L = Z_0 \frac{1 + \Gamma}{1 - \Gamma}$$

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