

# RADIO RECEIVER DESIGN

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$$z_{11} = \frac{z_{11,Z_0}}{Z_0} \quad z_{12} = \frac{z_{12,Z_0}}{Z_0} \quad z_{21} = \frac{z_{21,Z_0}}{Z_0} \quad z_{22} = \frac{z_{22,Z_0}}{Z_0} \quad 1.146$$

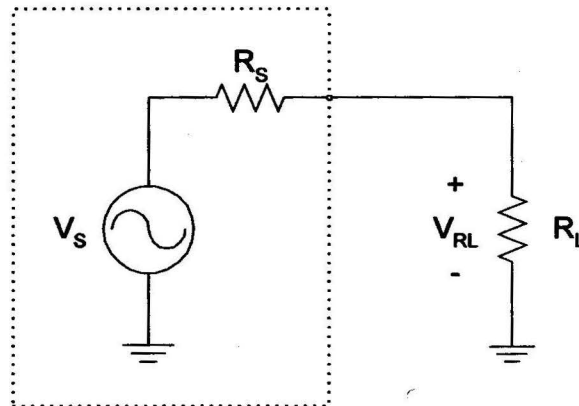
$$y_{11} = y_{11,Z_0} Z_0 \quad y_{12} = y_{12,Z_0} Z_0 \quad y_{21} = y_{21,Z_0} Z_0 \quad y_{22} = y_{22,Z_0} Z_0 \quad 1.147$$

$$h_{11} = \frac{h_{11,Z_0}}{Z_0} \quad h_{12} = h_{12,Z_0} \quad h_{21} = h_{21,Z_0} \quad h_{22} = z_{22,Z_0} Z_0 \quad 1.148$$

### 1.13 Matching and Maximum Power Transfer

We can model any practical signal source as Figure 1-35 indicates. The combination of  $V_S$  and  $R_S$  can be a signal generated, an antenna, or a RF amplifier. The value of  $R_S$  can be small, but it will never be zero. For a various reasons,  $R_S$  is set equal to  $Z_0$ , the system's characteristic impedance.

Let us assume the source in Figure 1-35 is an antenna. Then  $V_S$  represents the signal energy the antenna receives and  $R_S$  represents the radiation resistance of the antenna. If the load resistor represents a receiving system, the receiver should be able to take the maximum amount of signal power from the antenna into the load resistor  $R_L$ .



- o Signal Generator
- o Antenna
- o RF Amplifier

**Figure 1-35** Model used to derive maximum power transfer conditions.