



$$\Gamma_{in} = \frac{b_1}{a_1} = S_{11} + \frac{S_{12}S_{21}}{1 - S_{22}\Gamma_L}$$

$$(b) \because \Gamma_{in} = \frac{Z_{in} - Z_0}{Z_{in} + Z_0} = S_{11} + \frac{S_{12}S_{21}\Gamma_L}{1 - S_{22}\Gamma_L}$$

$$\therefore \text{当输入端被终端负载时, } \Gamma_{out} = \frac{\Gamma_{in} + \Gamma_s}{1 + \Gamma_{in}\Gamma_s} = \frac{S_{11} + S_{12}\Gamma_{in}}{1 - S_{22}\Gamma_{in}}$$

(c) 单向放大器:

假设反射只在负载端产生, 则 $\Gamma_{out} = \frac{S_{11} + S_{12}\Gamma_{in}}{1 - S_{22}\Gamma_{out}}$, S_{ij} 用来描述端口间关系

双向放大器:

反射即要考虑输入端口也要考虑输出端. ABCD 矩阵用来描述端口关系

(d) 单向: 忽略输出端口的反射

$$\Gamma_{in} \approx \frac{Z_{in} - Z_0}{Z_{in} + Z_0}$$

$$(e) \Gamma_s = S_{11} + \frac{S_{12}S_{21}\Gamma_{in}}{1 - S_{22}\Gamma_{in}}$$

$$(f) G_u = G_s \cdot S_L \cdot S_o.$$

$$= \frac{1 - |\Gamma_s|^2}{|1 - S_{11}\Gamma_s|^2} \cdot |S_{21}|^2 \cdot \frac{1 - |\Gamma_L|^2}{|1 - S_{22}\Gamma_L|^2}$$

为了得到 $G_u \max$, 每一项均要取最大值.

\therefore for G_s, G_L , 最大化 S_{11}, S_{22} , for G_o , 最大化 $|S_{21}|$, $G_u = 1 \cdot |S_{21}|_{\max}^2 \cdot 1 = 1$

$$\text{for } \Gamma_L, \Gamma_L = S_{22} + \frac{S_{12}S_{21}\Gamma_s}{1 - S_{11}\Gamma_s} = 0 \text{ 为匹配条件}$$