

Stabilitas Penguat

Ref : Pozar & Guillermo

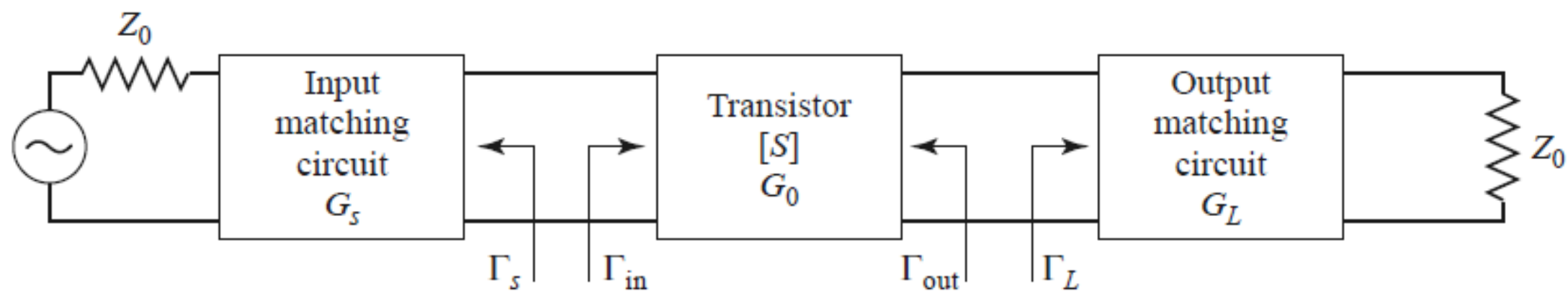


FIGURE 12.2 The general transistor amplifier circuit.

Stabilitas tanpa syarat, jika $|\Gamma_{in}| < 1$ dan $|\Gamma_{out}| < 1$

Unk semua impedansi sumber dan beban pasif.

Stabilitas bersyarat (potensi tidak stabil), jika $|\Gamma_{in}| < 1$ dan $|\Gamma_{out}| < 1$

Hanya untk wilayah impedansi sumber dan beban pasif tertentu

Lingkaran Stabilitas

$$|\Gamma_{in}| = \left| S_{11} + \frac{S_{12}S_{21}\Gamma_L}{1 - S_{22}\Gamma_L} \right| < 1,$$

$$|\Gamma_{out}| = \left| S_{22} + \frac{S_{12}S_{21}\Gamma_S}{1 - S_{11}\Gamma_S} \right| < 1.$$

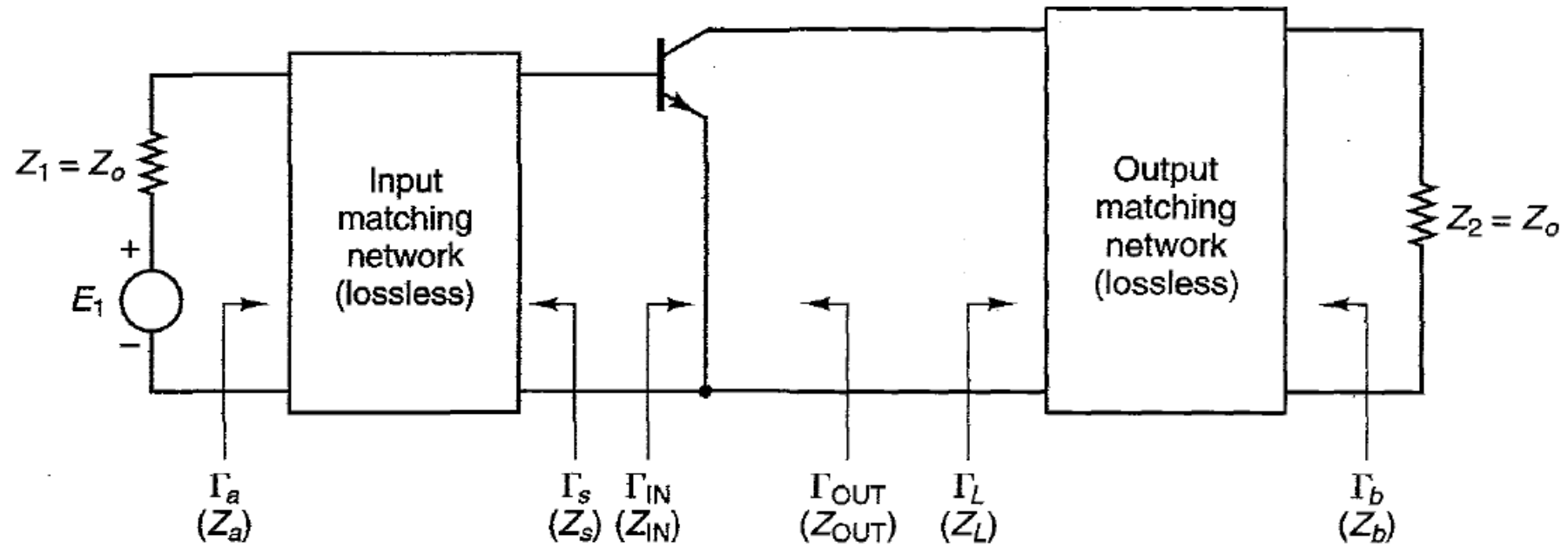
Pada perangkat unilateral ($S_{12} = 0$), stabilitas tanpa syarat cukup ditentukan oleh $|S_{11}| < 1$ dan $|S_{22}| < 1$

Wilayah Γ_S dan Γ_L dapat ditentukan dengan diagram Smith dan lingkaran Stabilitas

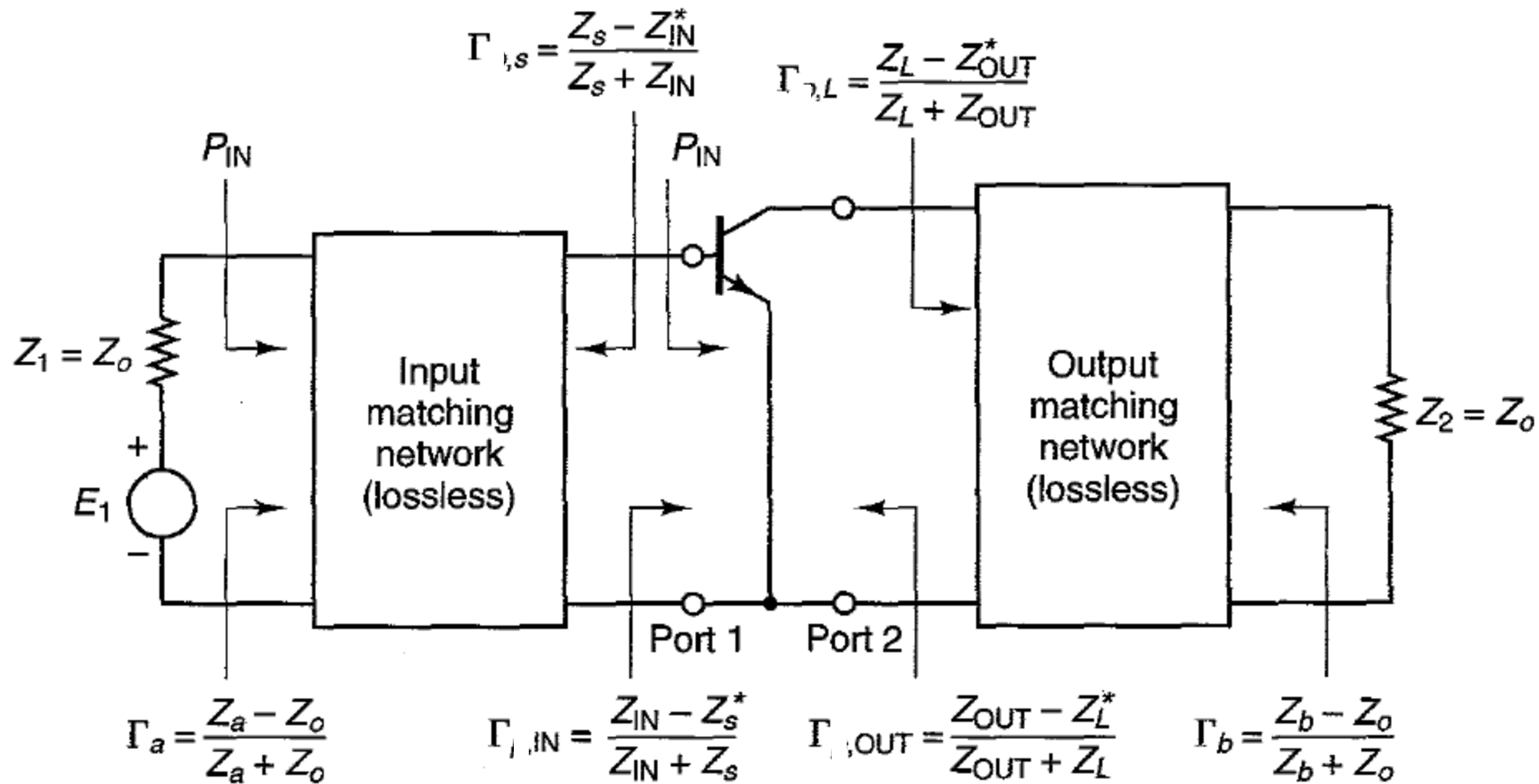
Lingkaran Stabilitas adalah Tempat Kedudukan Γ_S (atau Γ_L) dimana $|\Gamma_{in}| = 1$ (atau $|\Gamma_{out}| = 1$)

Γ_S dan Γ_L harus terletak di dalam diagram Smith (pada jar penyepadan pasif $|\Gamma_S| < 1, |\Gamma_L| < 1$)

Lingkaran stabilitas keluaran : $|\Gamma_{in}| = 1$



Microwave Amplifier



$$\Gamma_{\text{IN}} = \frac{b_1}{a_1} = S_{11} + \frac{S_{12}S_{21}\Gamma_L}{1 - S_{22}\Gamma_L} \quad \Gamma_{\text{OUT}} = \frac{b_2}{a_2} \Big|_{E_s=0} = S_{22} + \frac{S_{12}S_{21}\Gamma_s}{1 - S_{11}\Gamma_s}$$

$$|\Gamma_a| = \sqrt{1 - \frac{(1 - |\Gamma_s|^2)(1 - |\Gamma_{\text{IN}}|^2)}{|1 - \Gamma_s\Gamma_{\text{IN}}|^2}} = \left| \frac{\Gamma_{\text{IN}} - \Gamma_s^*}{1 - \Gamma_{\text{IN}}\Gamma_s} \right|$$

$$|\Gamma_b| = \sqrt{1 - \frac{(1 - |\Gamma_L|^2)(1 - |\Gamma_{\text{OUT}}|^2)}{|1 - \Gamma_{\text{OUT}}\Gamma_L|^2}} = \left| \frac{\Gamma_{\text{OUT}} - \Gamma_L^*}{1 - \Gamma_{\text{OUT}}\Gamma_L} \right|$$

$$M_s = \frac{(1 - |\Gamma_s|^2)(1 - |\Gamma_{\text{IN}}|^2)}{|1 - \Gamma_s\Gamma_{\text{IN}}|^2}$$

$$M_L = \frac{(1 - |\Gamma_L|^2)(1 - |\Gamma_{\text{OUT}}|^2)}{|1 - \Gamma_{\text{OUT}}\Gamma_L|^2}$$

$$\Gamma_a = \frac{Z_a - Z_o}{Z_a + Z_o} \quad \Gamma_s = \frac{Z_s - Z_o}{Z_s + Z_o}$$

$$\Gamma_L = \frac{Z_L - Z_o}{Z_L + Z_o} \quad \Gamma_b = \frac{Z_b - Z_o}{Z_b + Z_o}$$

$$|\Gamma_a| = \sqrt{1 - M_s}$$

$$|\Gamma_b| = \sqrt{1 - M_L}$$

$$(\text{VSWR})_{\text{in}} = \frac{1 + |\Gamma_a|}{1 - |\Gamma_a|}$$

$$(\text{VSWR})_{\text{out}} = \frac{1 + |\Gamma_b|}{1 - |\Gamma_b|}$$