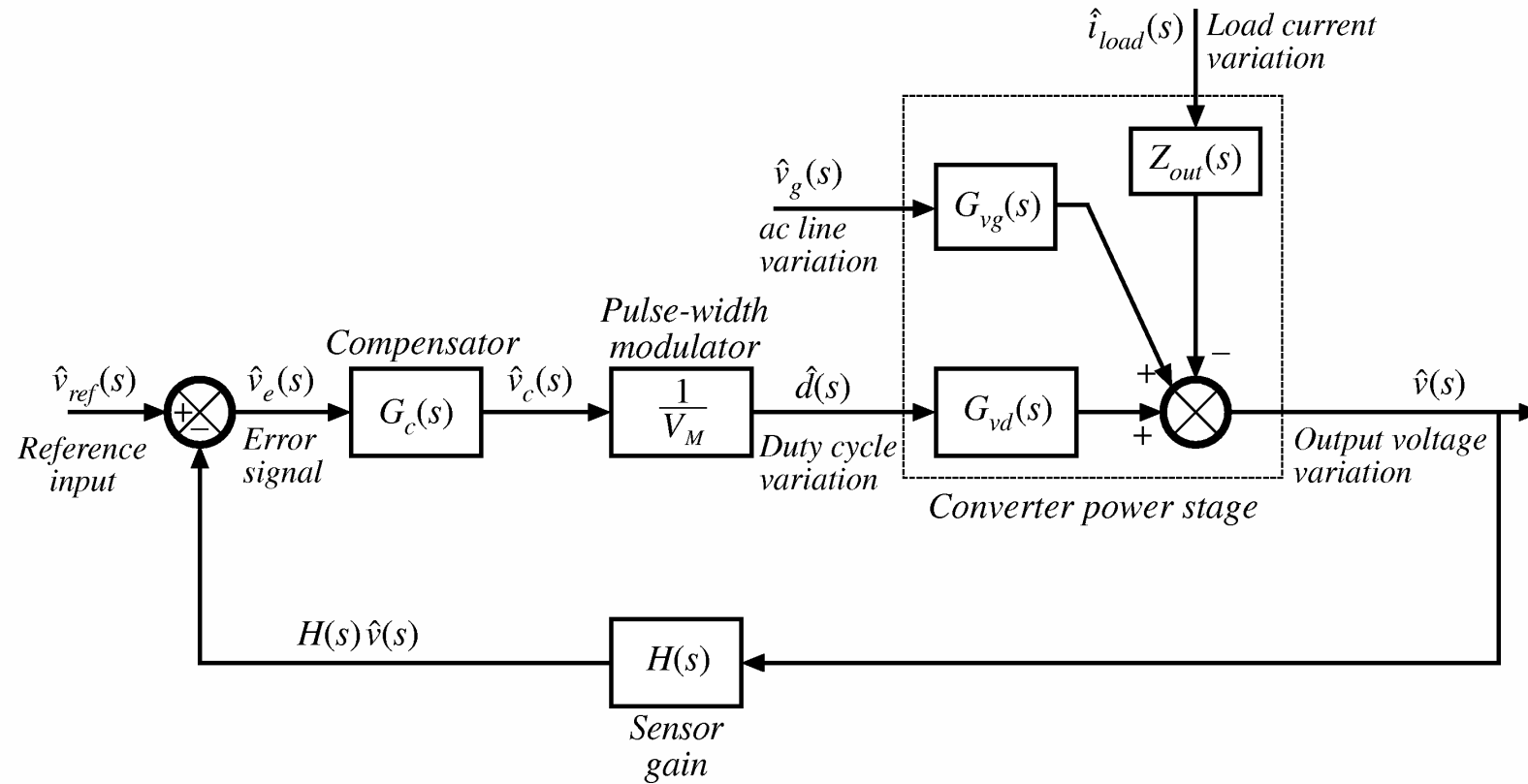


Block Diagram

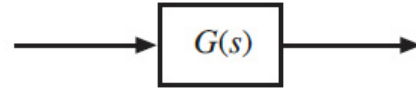


Closed-Loop Transfer Functions

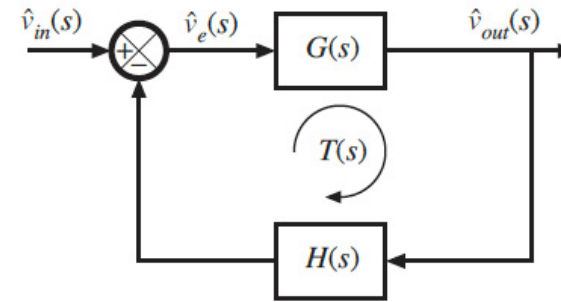
Solution of Block Diagram

Open-Loop and Closed-Loop

Open loop

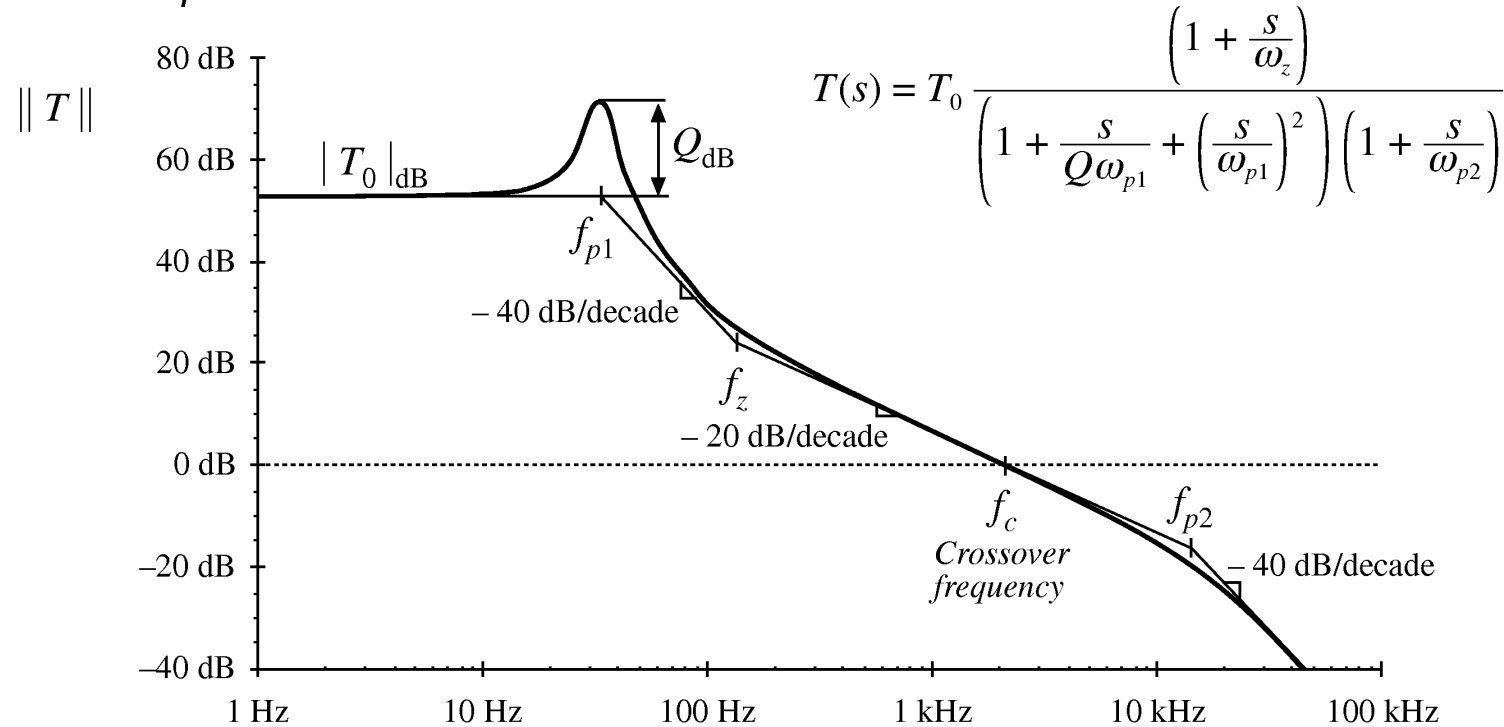


Closed loop



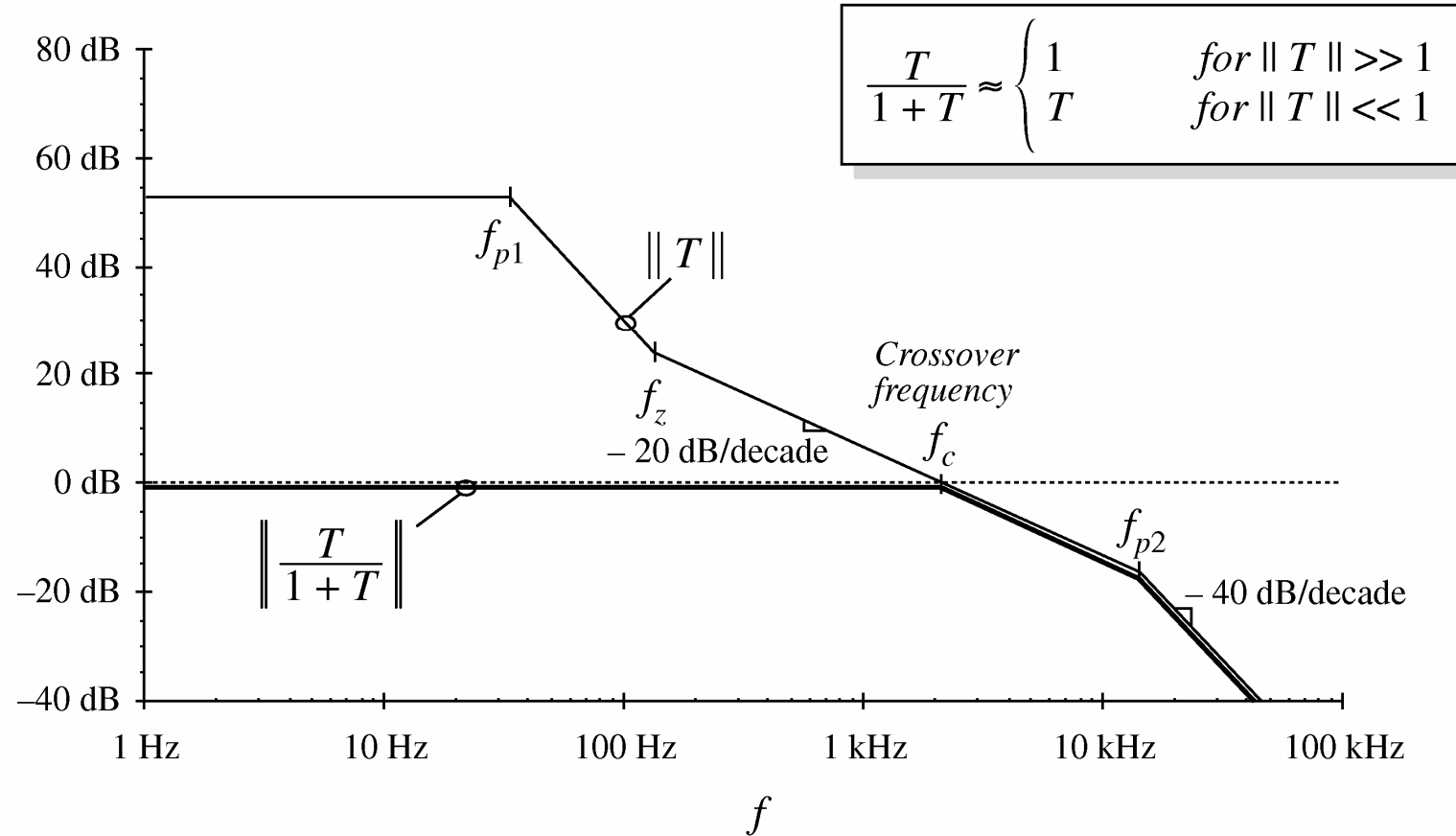
Construction of the Loop Gain

Example

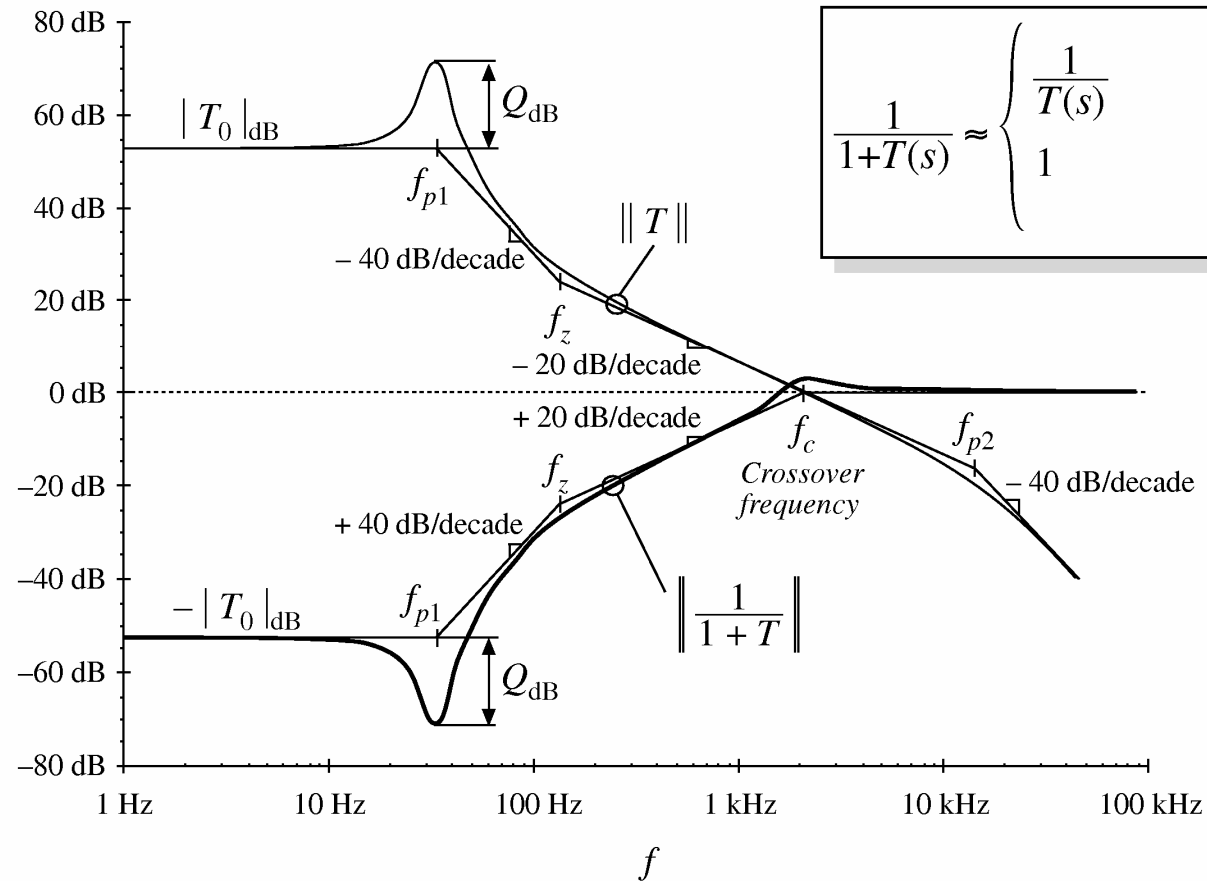


At the crossover frequency f_c , $\|T\| = 1$ f

Tracking of Reference



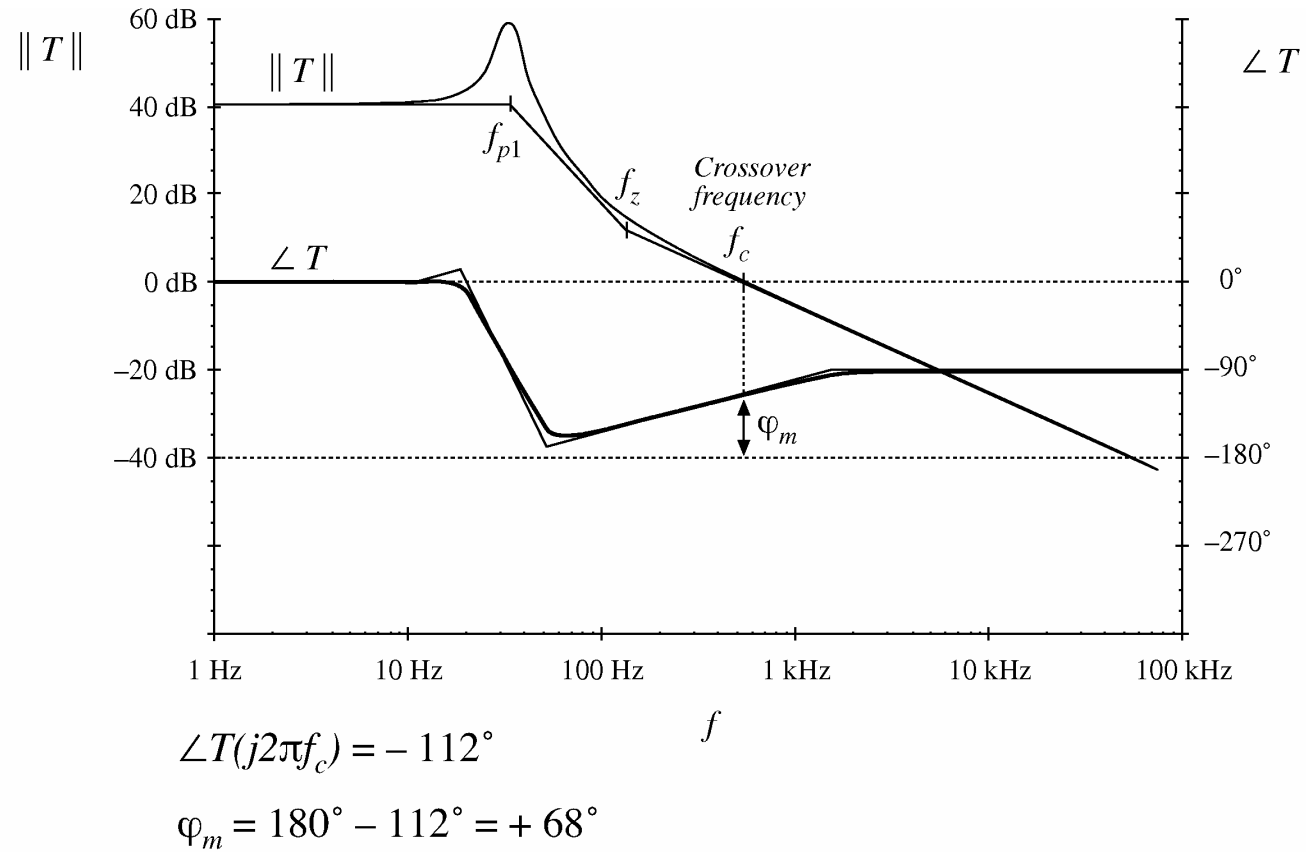
Rejection of Disturbances



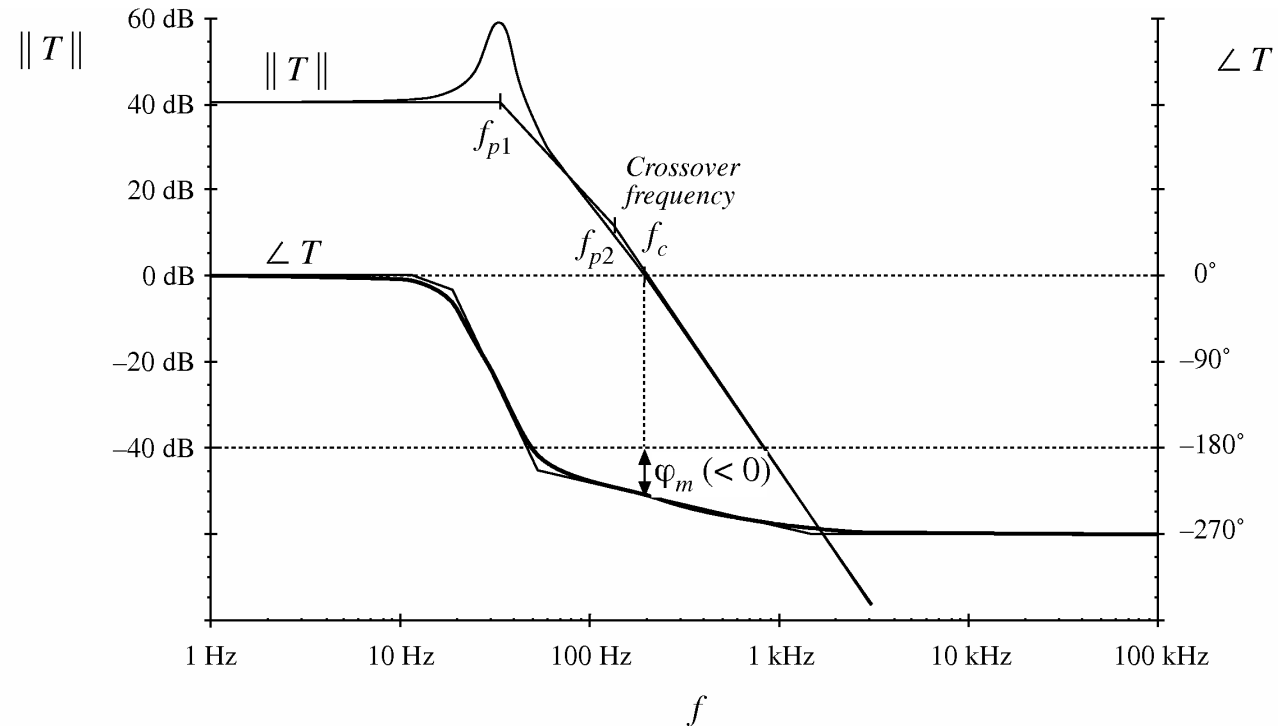
Determining Stability From $T(s)$

The Phase Margin Test

Example: Stable System



Example: Unstable System



$$\angle T(j2\pi f_c) = -230^\circ$$

$$\varphi_m = 180^\circ - 230^\circ = -50^\circ$$

Nyquist Stability Criterion

$$T(s) = (s - 1)$$

