Chapter 4 - Mos Inverter - Intro and Definitions

Inverter symbol

Types of inverters

1) Static
   - All nodes have a DC path to ground or VDD
   - If clocks are used, they are applied to the logic inputs

2) Dynamic
   - Requires periodic clocks synchronized with data signals
   - Clocks are applied to the load elements and to transfer gates

Voltage Transfer Characteristics

Ideal:

![Voltage Transfer Characteristic Diagram]

Input range for 1
Input range for 0

Output range < Input range
Practical:

Gain = 1
Gain = \frac{dV_{out}}{dV_{in}}

Input range

Output range

V_{DD}
V_{IH}
V_{IL}
0

V_{DD}
V_{IH}
V_{IL}
0
Noise Margin Definitions

Noise → unwanted signal (voltage or current) at the logic nodes.

Noise Margin (NM) → largest magnitude of noise at the input that will be attenuated as it passes from the input to output.

Single-source noise margin (SSNM)
SSNM_H = (V_{OH} - V_{S})

SSNM_L = (V_{S} - V_{OL})

Multiple-source NM

If |gain| < 1, noise can't grow.

\[
\begin{align*}
NM_H &= V_{OH} - V_{IL} \\
NM_L &= V_{IL} - V_{OL}
\end{align*}
\]