



1. The data sheet of SN7400 quad 2-input NAND gate of the TIL family provides the following:
 - Logic-1 input voltage required at both input terminals to ensure a logic-0 level at the output : MIN (minimum) 2V.**
 - Logic-0 input voltage required at either input terminal to ensure a logic-1 at the output : MAX (maximum) 0.8V.**
 - Logic-1 output voltage: MIN 2.4 V, TYP (typical) 3.3 V**
 - Logic-0 output voltage: TYP 0.22V, MAX 0.4V.**
 - Logic-0 level supply current: TYP 12mA, MAX 22mA (for the entire package).**
 - Logic-1- level supply current: TYP 4mA, MAX 8Ma (for the entire package).**
 - Propagation delay time to logic-0 level: TYP 7 ns, MAX 15ns.**
 - Propagation delay time to logic-1 level: TYP 11ns, MAX 22ns.**
 - a. Find the noise margin in both the 0 and the 1 states
 - b. Assuming that the gate is in the 1 state 50% of the time and in the 0 state 50% of the time, find the average static power dissipated in a typical gate. The power supply voltage is 5V.
 - c. Assuming that the gate drives a capacitance $C_L = 45$ pF and is switched at a 1 MHz rate, find the dynamic power dissipation per gate using the typical values of the logic 1 and 0 levels at the output.
 - d. Find the typical value of the gate delay –power product (neglect the dynamic power dissipation)
2. A logic inverter having negligible static power dissipation is switched at the rate of 1 MHz. If the inverter is operated from a 10V-power supply and drives a 50-pF capacitance, find the dynamic power dissipation and the average current drawn from the power supply. Assume that the output levels are close to 0 and 10 V.
3. Consider the basic inverter discussed in the lecture under the conditions that $V^+ = 5.5V$, $R_L = 10k\Omega$ and the switch on resistance is $1 k\Omega$. Let $V_{off} = 0V$. Find the values of V_{OL} and V_{OH} .
4. Let the inverter specified in 3 be fed with an ideal pulse having zero rise and fall times. Assuming that the switch operates instantaneously, find the propagation delays t_{PHL} and t_{PLH} and τ_p that result with a 50-pF load capacitance.