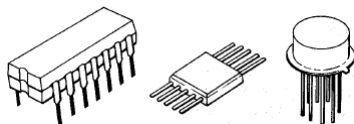


Logička kola

Familije i karakteristike

Logička kola

- Integrirani sklopovi
- Izvršavaju logičke i aritmetičke operacije, memorisanje, konverzije...
- Jednostavna upotreba
- "Mogu" se posmatrati kao crna kutija



Familije

- 74F - Fast Logic
- ABT - Advanced BiCMOS Technology
- ABTE - Advanced BiCMOS Technology / Enhanced Transceiver Logic
- AC - Advanced CMOS Logic
- ACT - Advanced CMOS Logic
- AHC - Advanced High-Speed CMOS
- AHCT - Advanced High-Speed CMOS
- ALB - Advanced Low-Voltage BiCMOS
- ALS - Advanced Low-Power Schottky Logic
- ALVC - Advanced Low-Voltage CMOS Technology
- ALVT - Advanced Low-Voltage BiCMOS Technology
- AS - Advanced Schottky Logic
- AVC - Advanced Very-Low-Voltage CMOS Logic
- BCT - BiCMOS Technology
- CBT - Crossbar Technology
- CBTLV - Low-Voltage Crossbar Technology

Familije nastavak

- CD4000 - CMOS Logic
- FB - Backplane Transceiver Logic
- FCT - Fast CMOS Technology
- GTL - Gunning Transceiver Logic
- GTLP - Gunning Transceiver Logic Plus
- HC - High-Speed CMOS Logic
- HCT - High-Speed CMOS Logic
- HSTL - High Speed Transceiver Logic
- JTAG - Boundary Scan Logic
- LS - Low-Power Schottky Logic
- LV - Low-Voltage CMOS Technology
- LVC - Low Voltage CMOS Technology
- LVT - Low-Voltage BiCMOS Technology
- PCA - Personal Computer I2C Interface
- S - Schottky Logic
- SSTL - Stub Series Terminated Logic
- TTL - Transistor-Transistor Logic
- TVC - Translation Voltage Clamp

Definicije naponskih i strujnih nivoa

<i>Symbol</i>	<i>Definition</i>
V_{IH}	HIGH-state input voltage, corresponding to logic 1 at input
V_{IL}	LOW-state input voltage, corresponding to logic 0 at input
V_{OH}	HIGH-state output voltage, corresponding to logic 1 at output
V_{OL}	LOW-state output voltage, corresponding to logic 0 at output
I_{IH}	HIGH-state input current; current flowing from input when the input voltage corresponds to logic 1.
I_{IL}	LOW-state input current; current flowing from an input when the input voltage corresponds to logic 0.
I_{OH}	HIGH-state output current; current flowing from output when the output voltage corresponds to logic 1.
I_{OL}	LOW-state output current; current flowing from an output when the output voltage corresponds to logic 0.

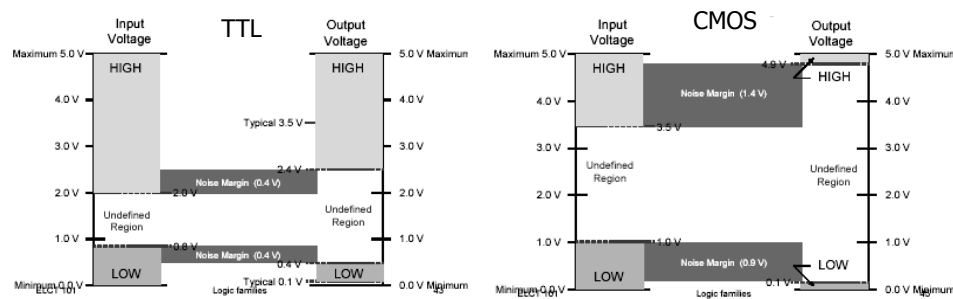
Margina šuma

- Razlika između najgoreg slučaja izlaznog napona jednog stepena i najgoreg slučaja ulaznog napona sledećeg stepena
- Što je veća razlika (veća margina) dozvoljena je veća amplituda šuma, a da ne dođe do pogrešnog tumačenja logičkog nivoa

Margina šuma

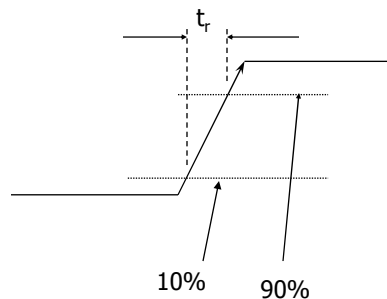
$$NM_{\text{high}} = V_{\text{OHmin}} - V_{\text{IHmin}}$$

$$NM_{\text{low}} = V_{\text{ILmax}} - V_{\text{OLmax}}$$



Brzina

- Vreme uspona – Rise Time
- Vreme pada – Fall Time
- Vreme propagacije – Propagation Delay



Vreme propagacije

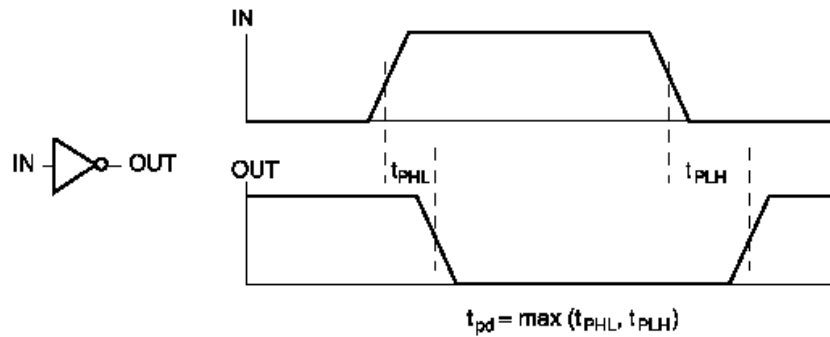


Fig. 2-40 Propagation Delay for an Inverter

Snaga disipacije

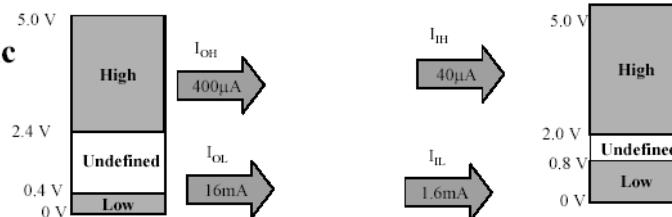
- Statička
 - I^2R gubici na pasivnim komponentama
- Dinamička
 - I^2R gubici usled punjenja i pražnjenja kapacitivnosti kroz otpornike

Faktor grananja

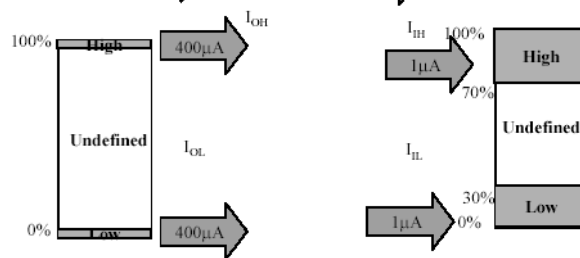
- Ulazni – Fan In
 - Broj ulaznih signala u logičku kapiju
 - Nije električna karakteristika
- Izlazni – Fan Out
 - Mera sposobnosti izlaza logičke kapije da pobuđuje veći broj ulaza logičkih kapija
 - Daje se u broju standardnih ulaza iste familije koje može pobuditi
 - Jeste električna karakteristika – od čega zavisi?

Strujne mogućnosti izlaza

• TTL Logic Standard



• CMOS Logic 4000 Series





Ulazni stepen

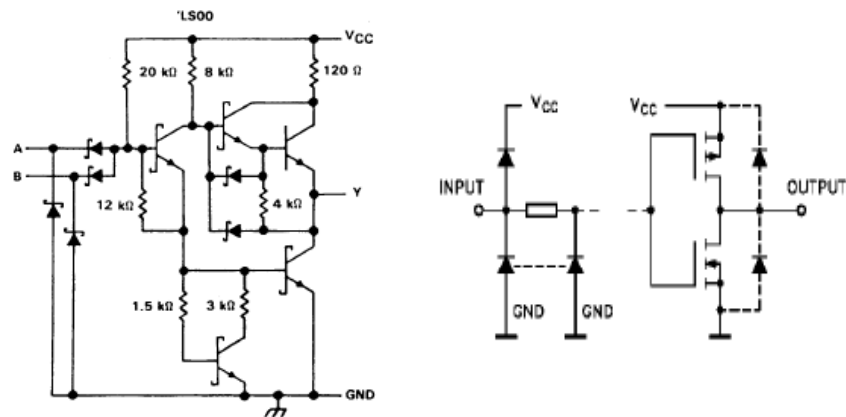
- Standardni
- Šmit trigger



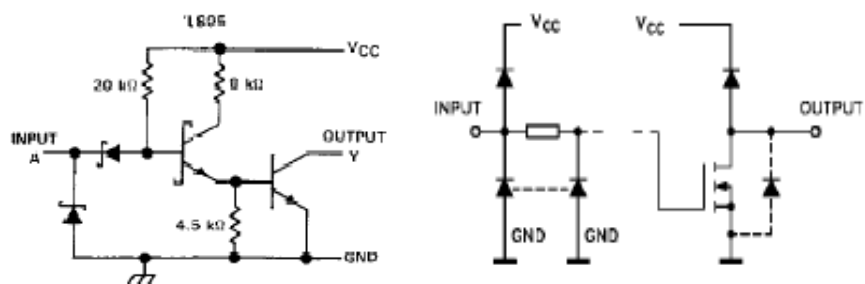
Izlazni stepen

- Totem pole
- Open collector / drain
- Bus driver

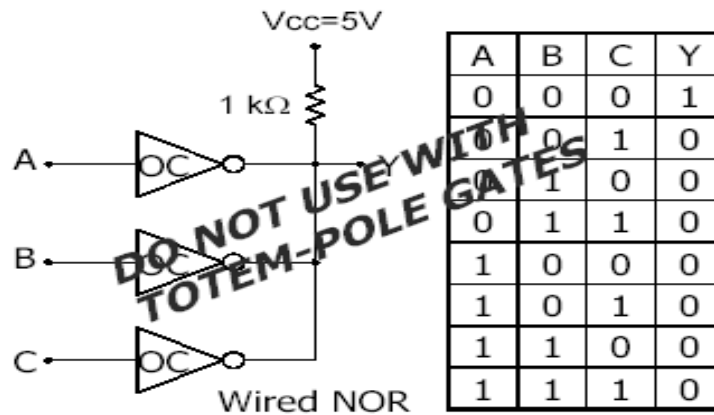
Totem pole izlaz LS i HC familije



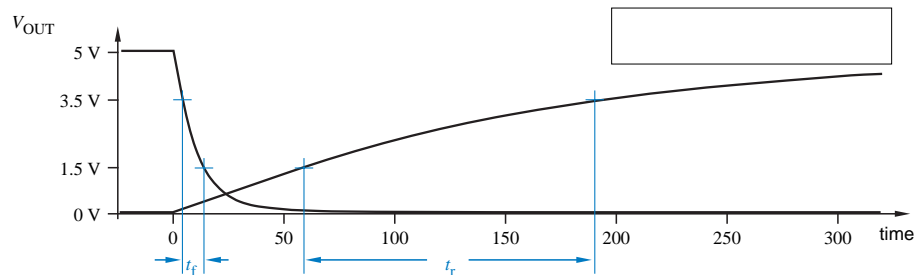
Open collector / drain izlaz LS i HC familije



Kratko spajanje open-drain izlaza



Brzina promene logičkog nivoa open-drain izlaza





Primer logičkih kola

- 74LS00
- 74LS14
- 74LS03
- 74LS240
- 74HC00 i 74HCT00
- 74HC14
- 74HC03
- 74HC240



Sekvencijalna logička kola

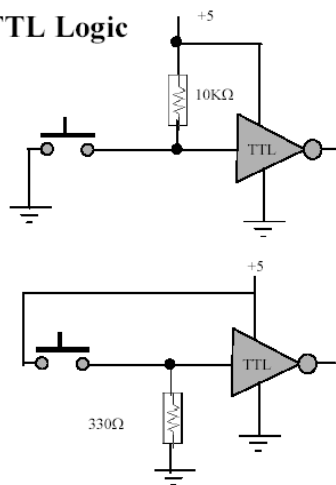
- Bistabilni multivibrator – flip flop
- Brojači
- Registri
- Memorije

Primeri sekvencijalnih kola

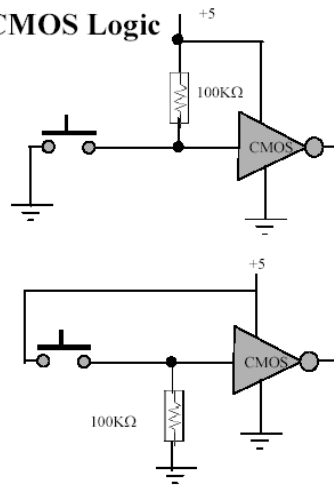
- Flip-flop 74LS74
- Asinhroni brojač 74LS93
- Sinhroni brojač 74LS161
- Registar 74LS273
- Registar 74LS373
- Pomerački registar 74LS165
- Pomerački registar 74LS595

Spajanje ulaza

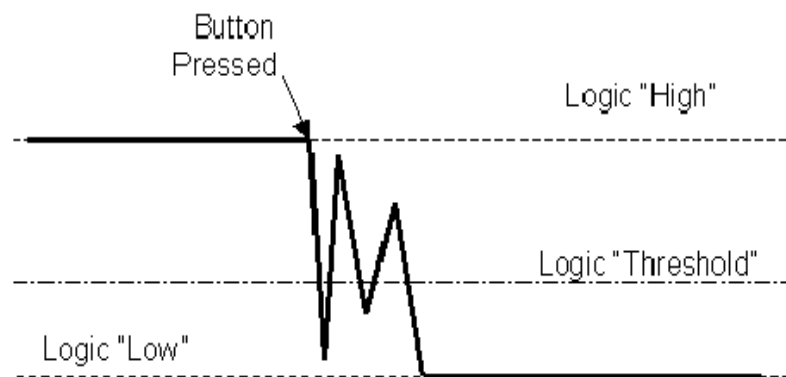
• TTL Logic



• CMOS Logic

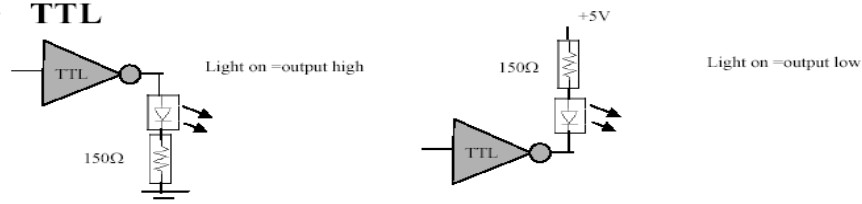


Treperenje (bounce) mehaničkih kontakata



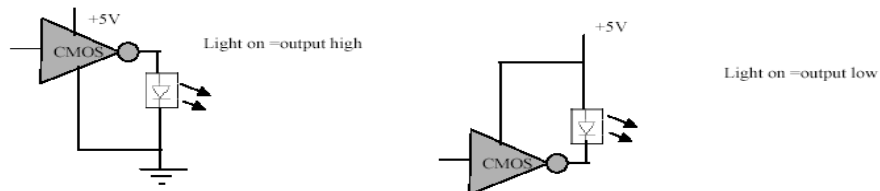
Spajanje izlaza sa LED

• TTL



• CMOS

For 10-15 V add resistors, and also if you use CMOS buffers, then also add resistors.



Spajanje izlaza sa snažnijim potrošačima

