

Tastatura



Taster

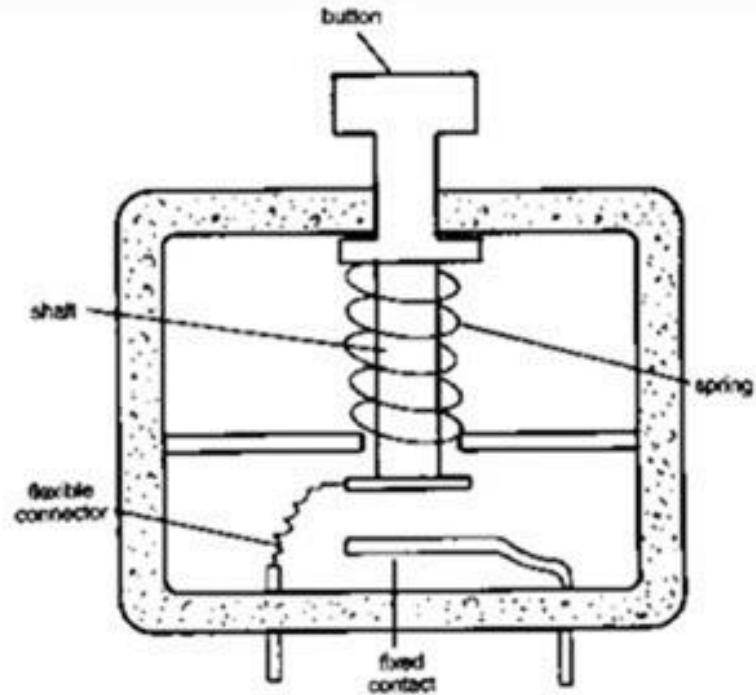
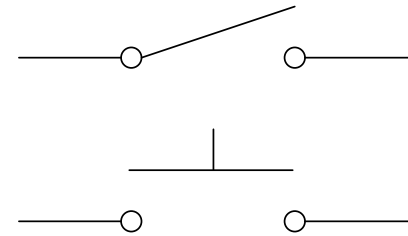
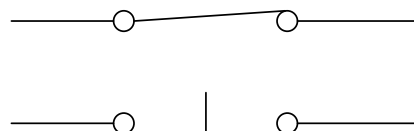
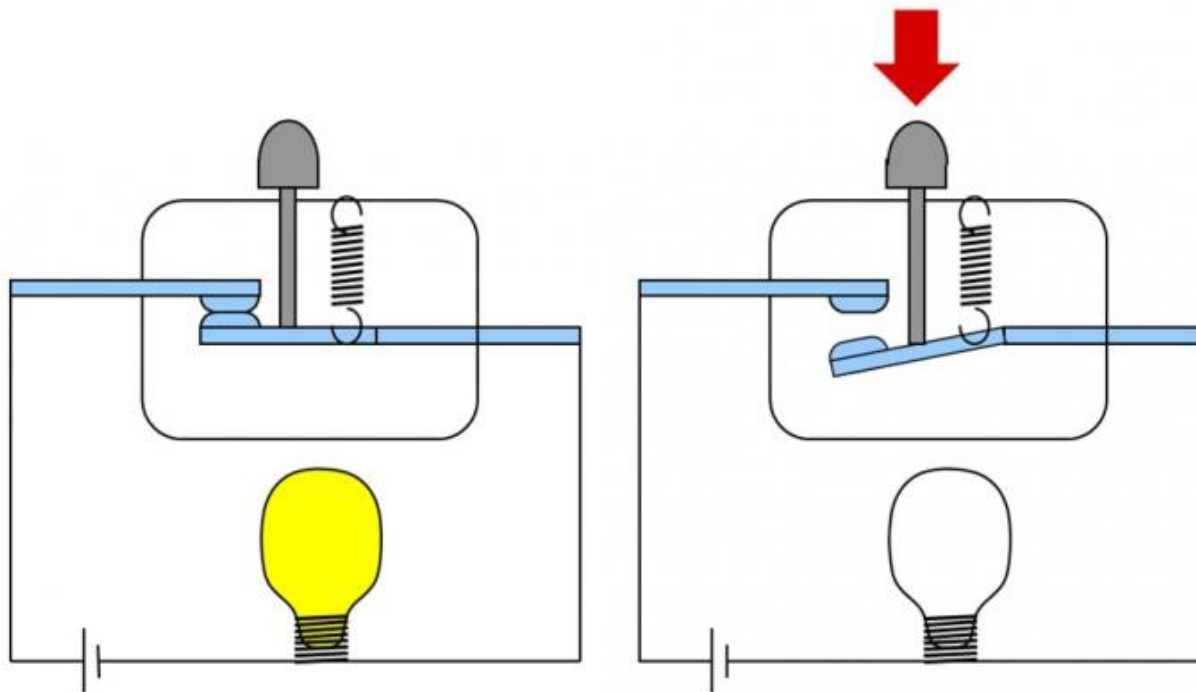


Figure 11.6 Operating principle of the momentary-contact push-for-on switch.



NO – normally open – normalno otvoreni



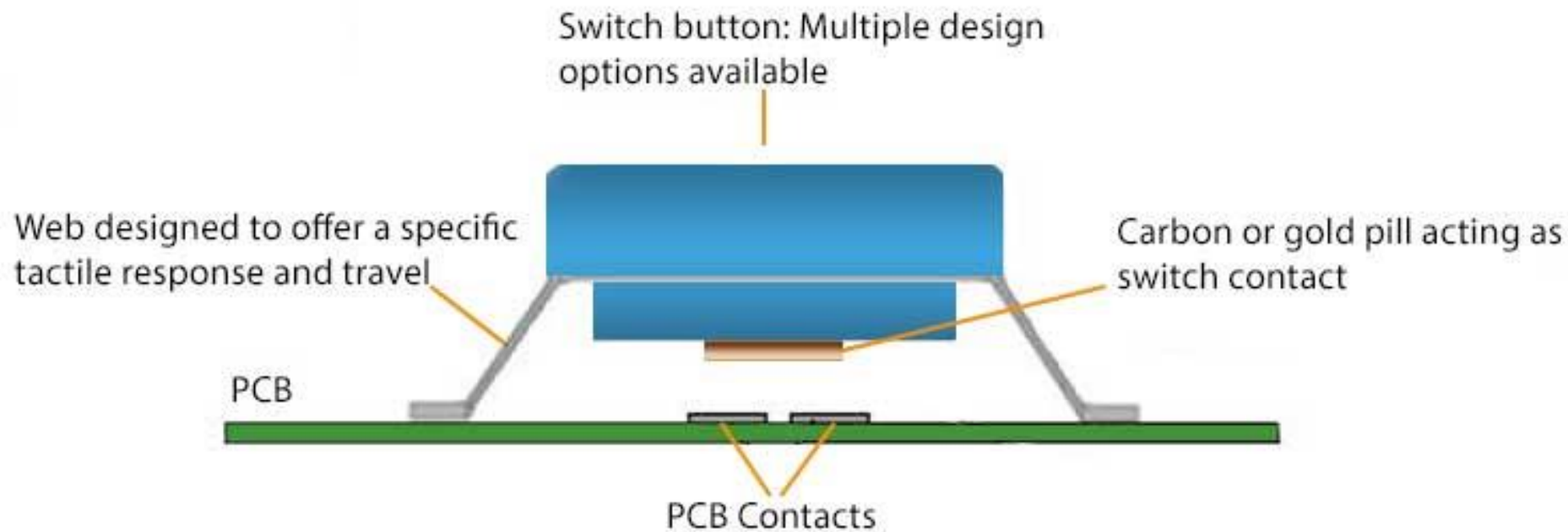


NC – normally closed – normalno zatvoreni

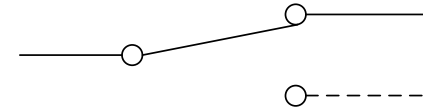
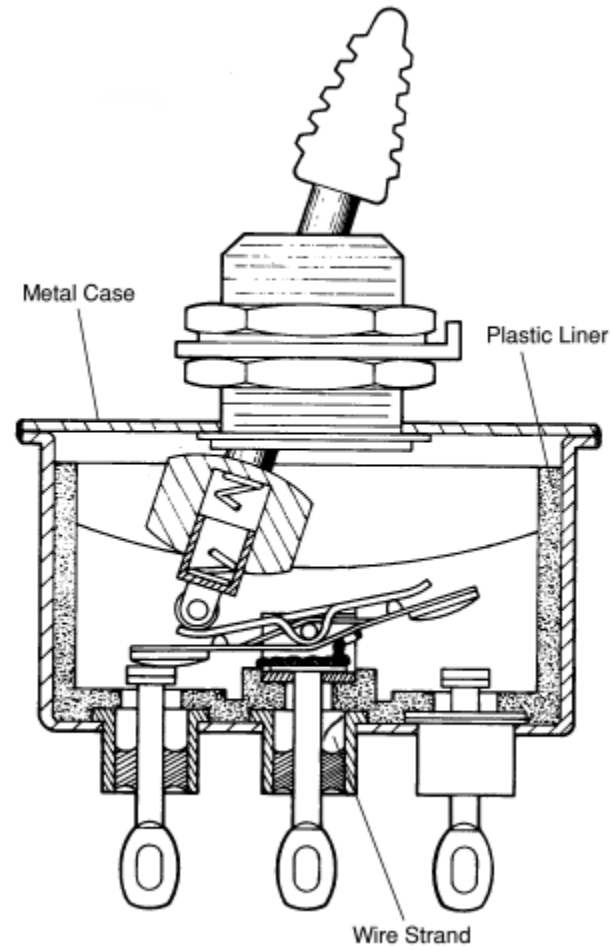
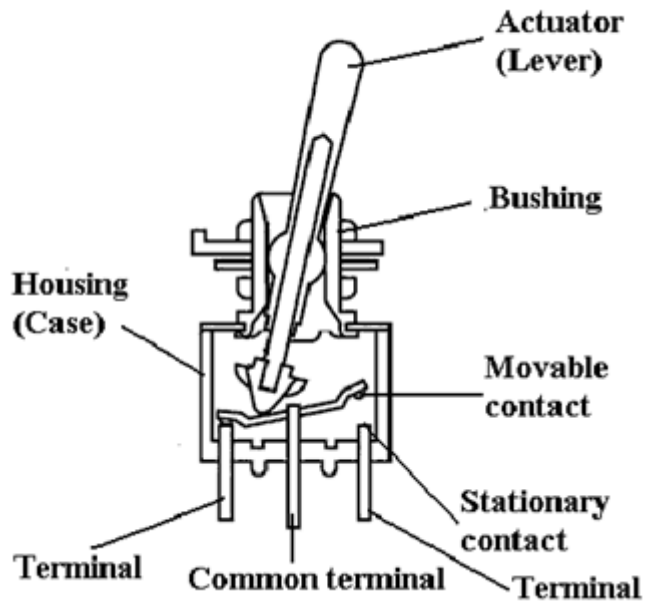


Česta realizacija - jeftina

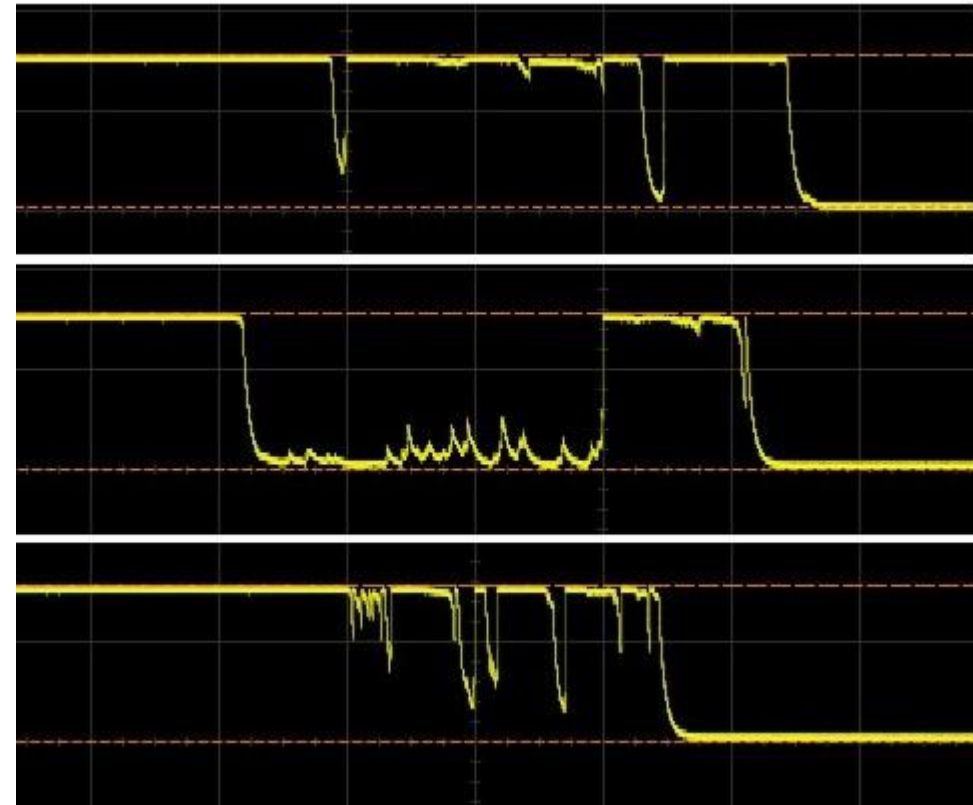
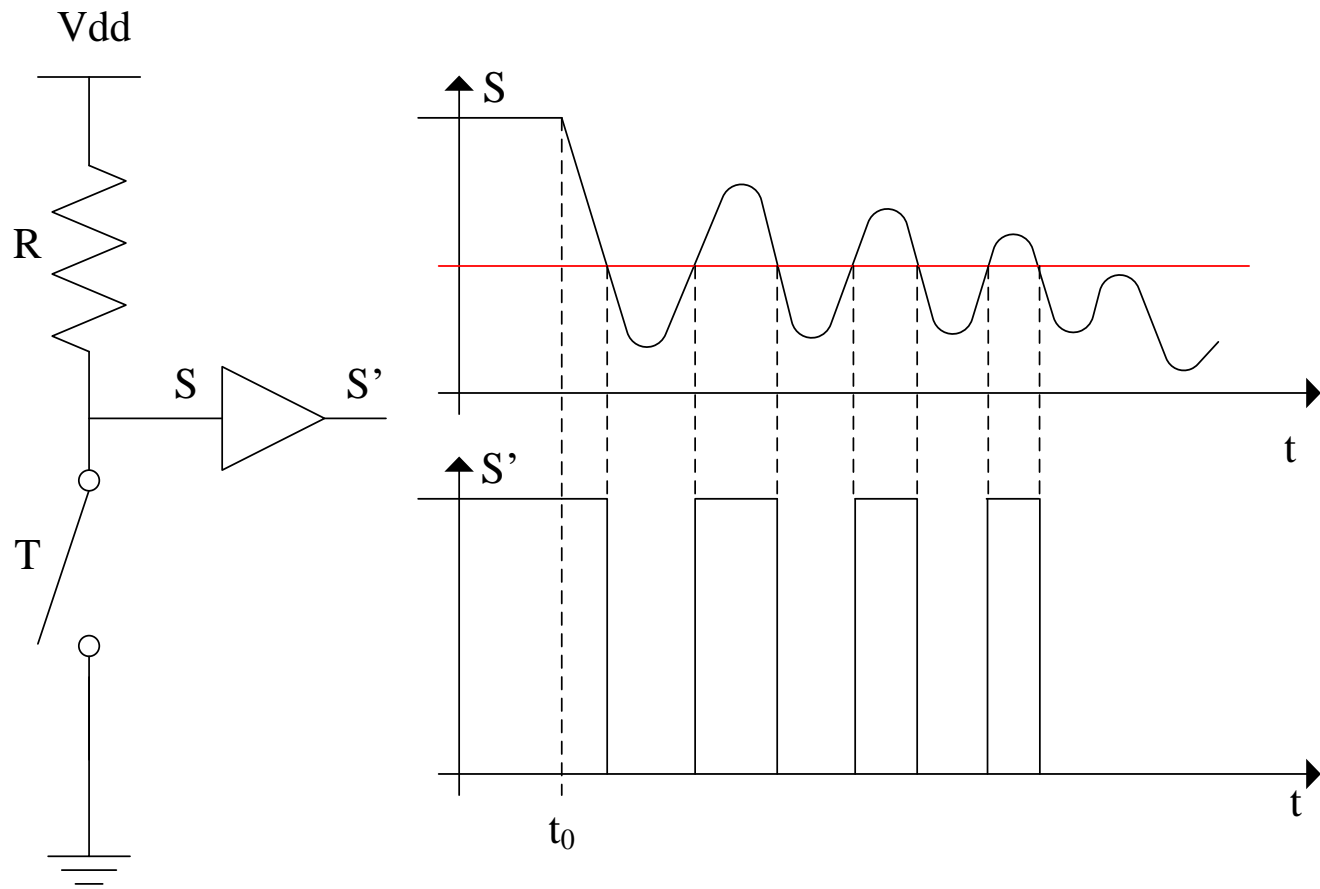
Basic Silicone Keypad Switch Design



Prekidač



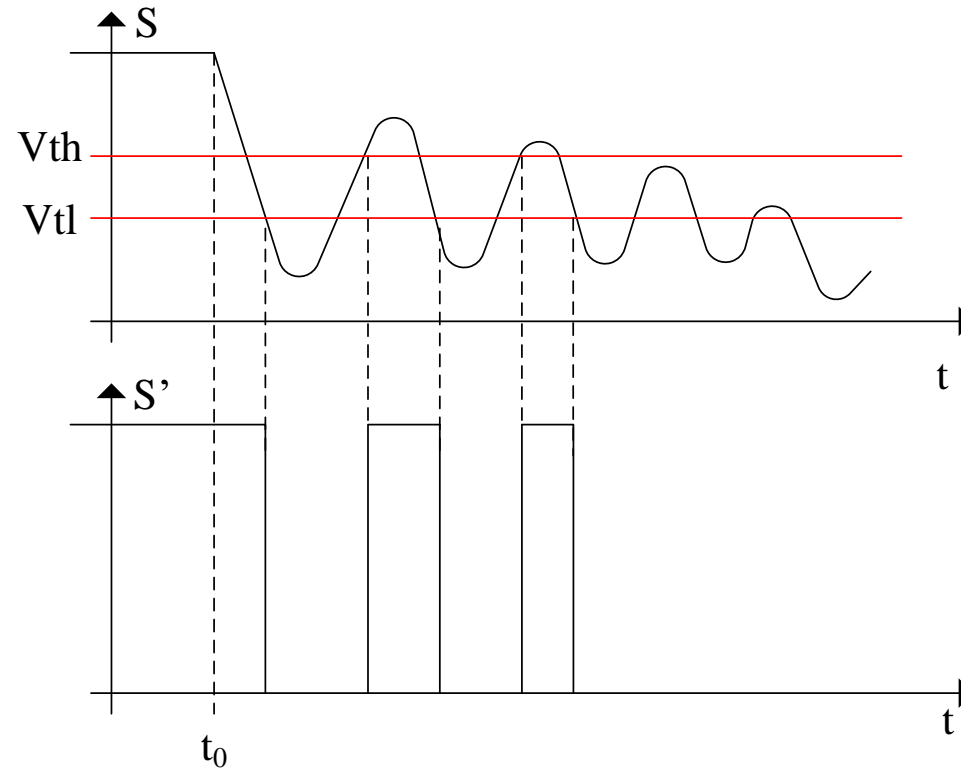
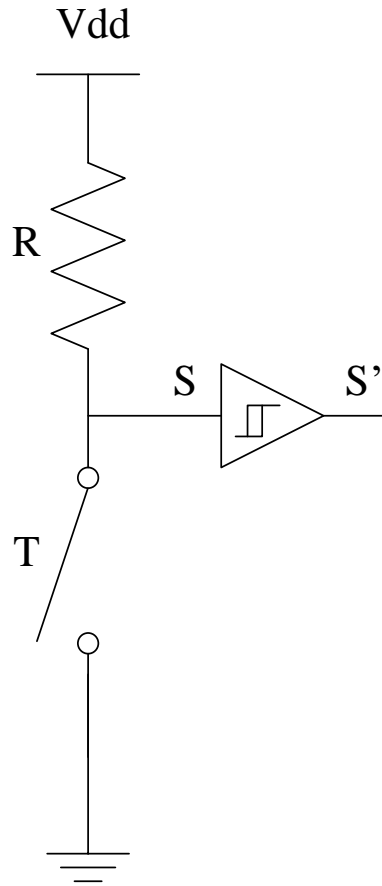
Detekcija položaja tastera



Bouncing – baunsiranje - odskakanje



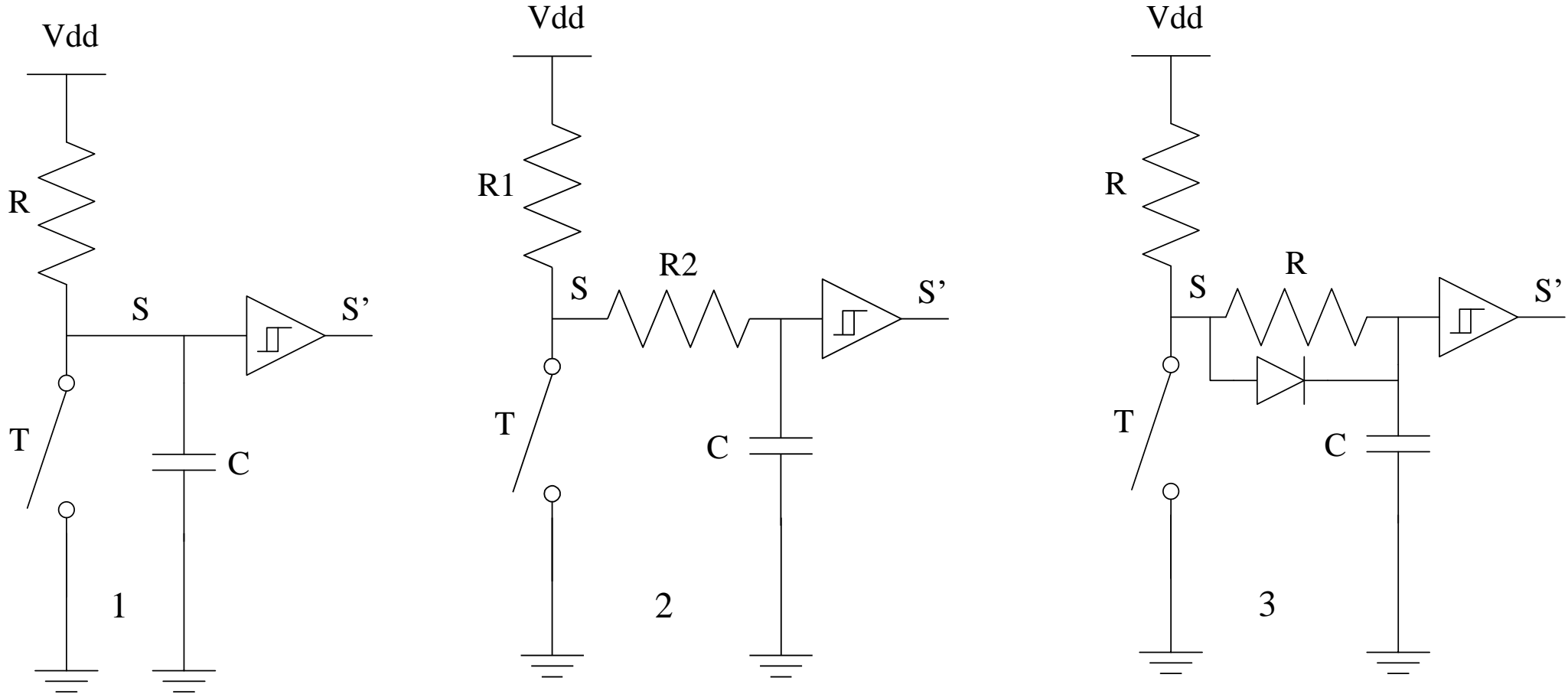
Koliko može da pomogne kolo sa histerezisom – dodatak Šmitovog kola



I dalje mogu da postoje artefakti
Opasno ako se koristi kao prekidni ulaz



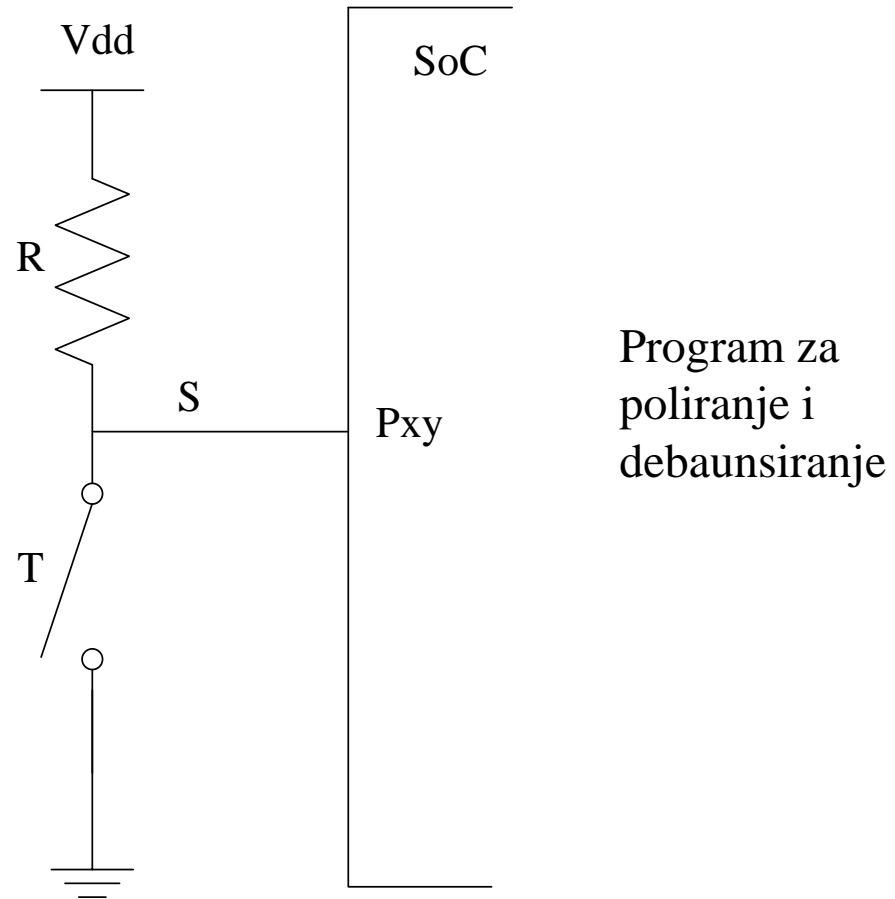
Hardversko debaunsiranje



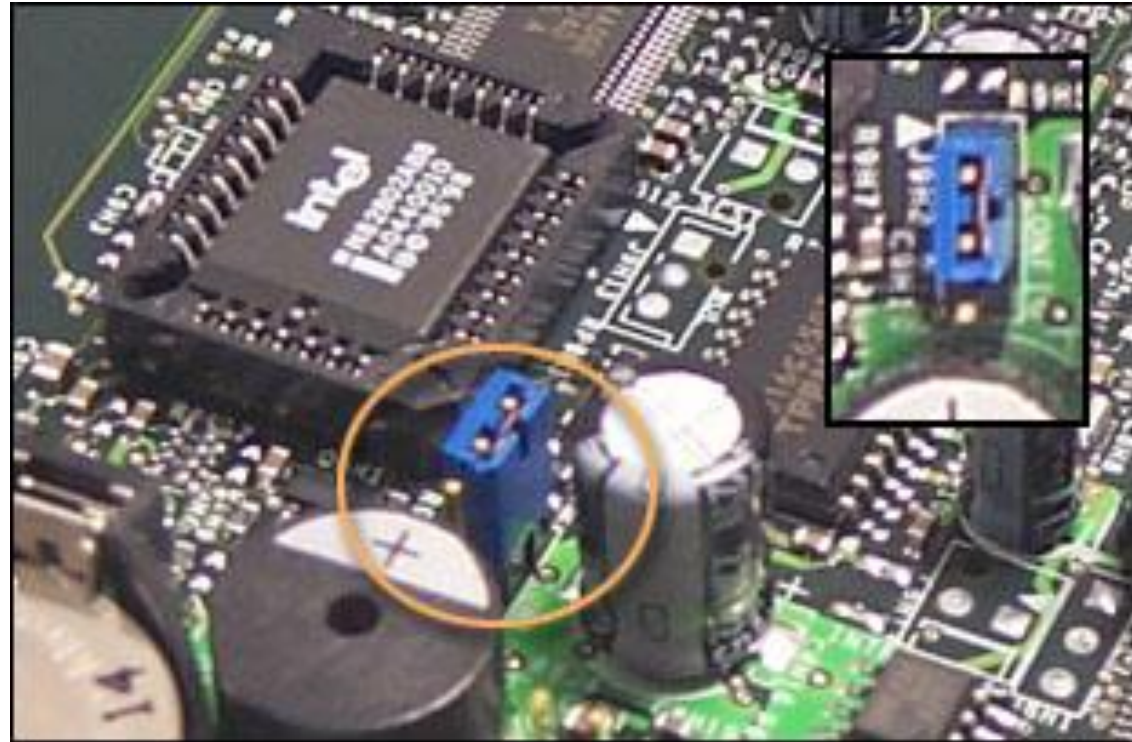
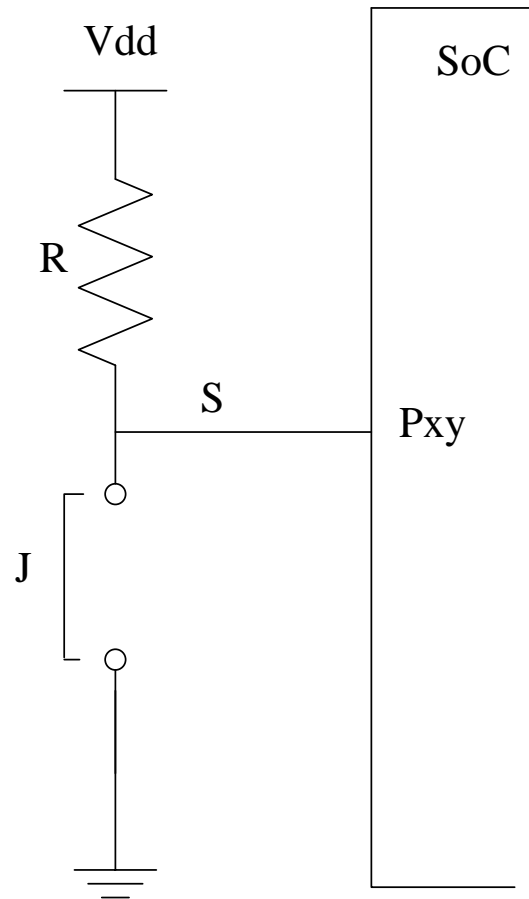
Ili neka eliminacija gličeva na način koji smo videli
– RC – Pomerački registar - ...



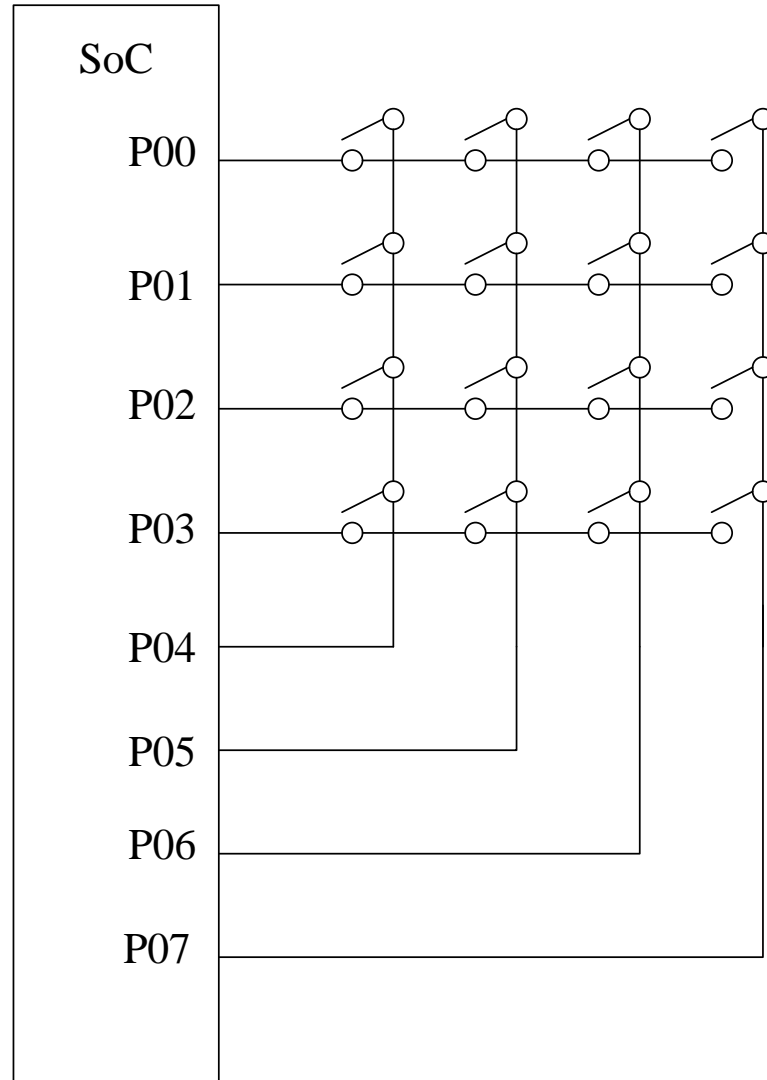
Softversko debaunsiranje – često najjednostavnije i najjeftinije



Jumper



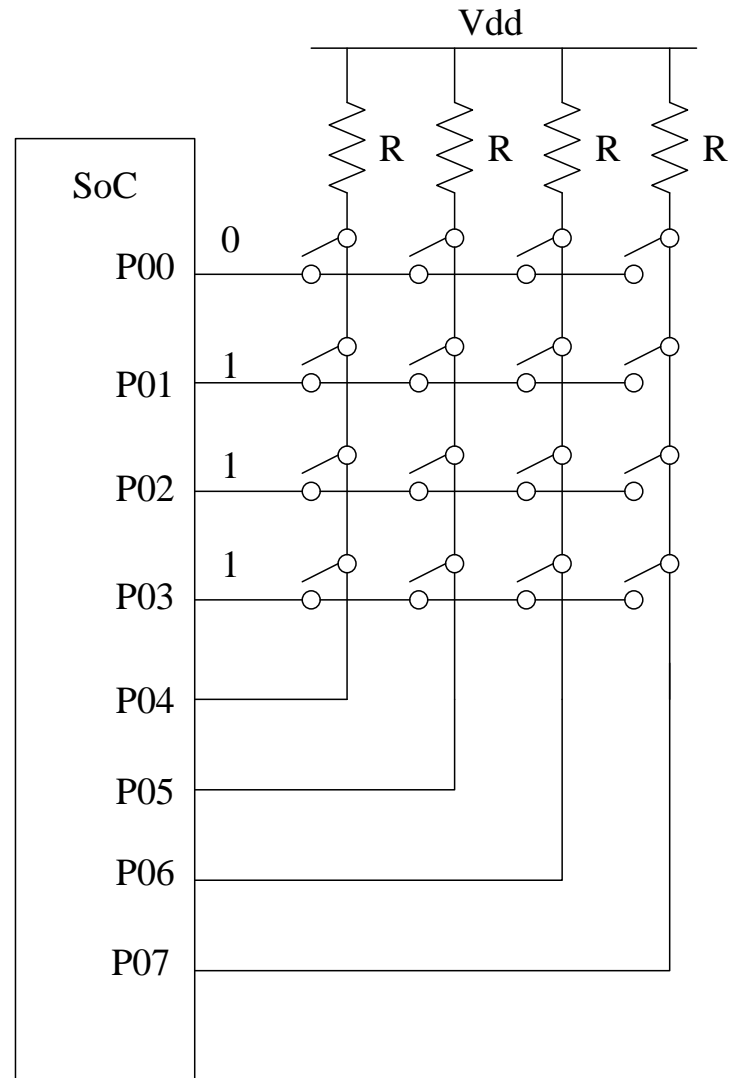
Puno tastera – Izlaz - vremensko i prostorno multipleksiranje



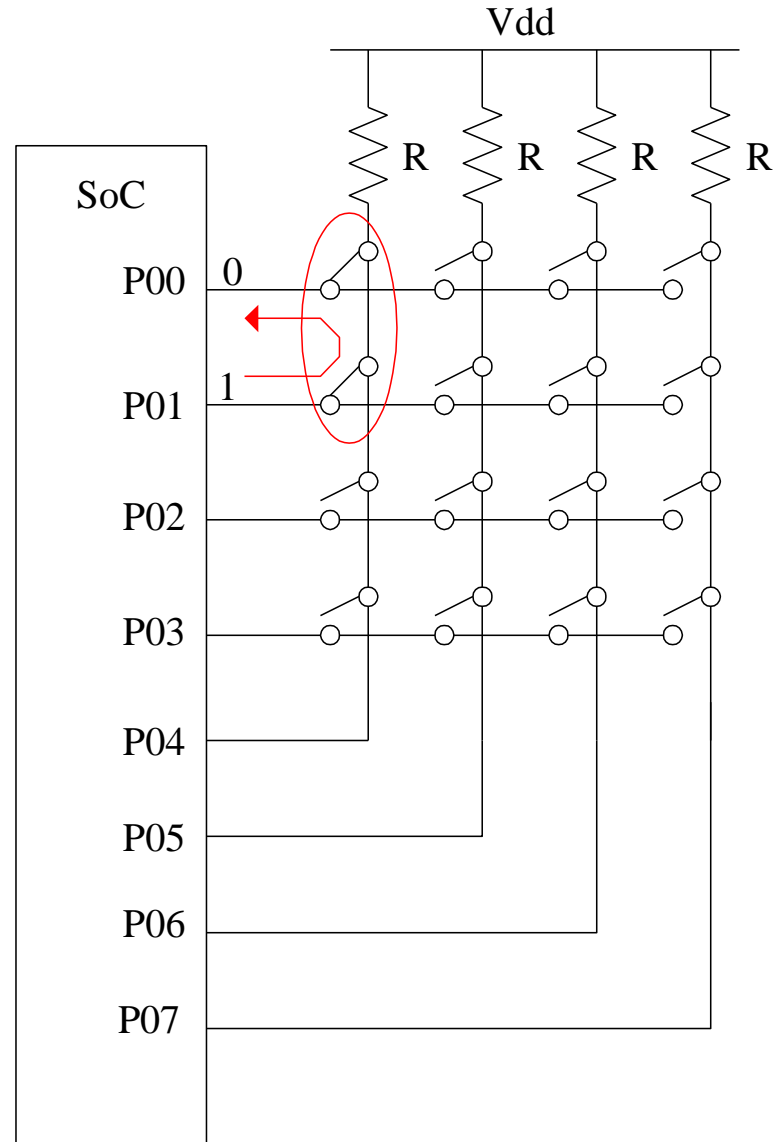
Samo ako su portovi kvazibiderkcioni



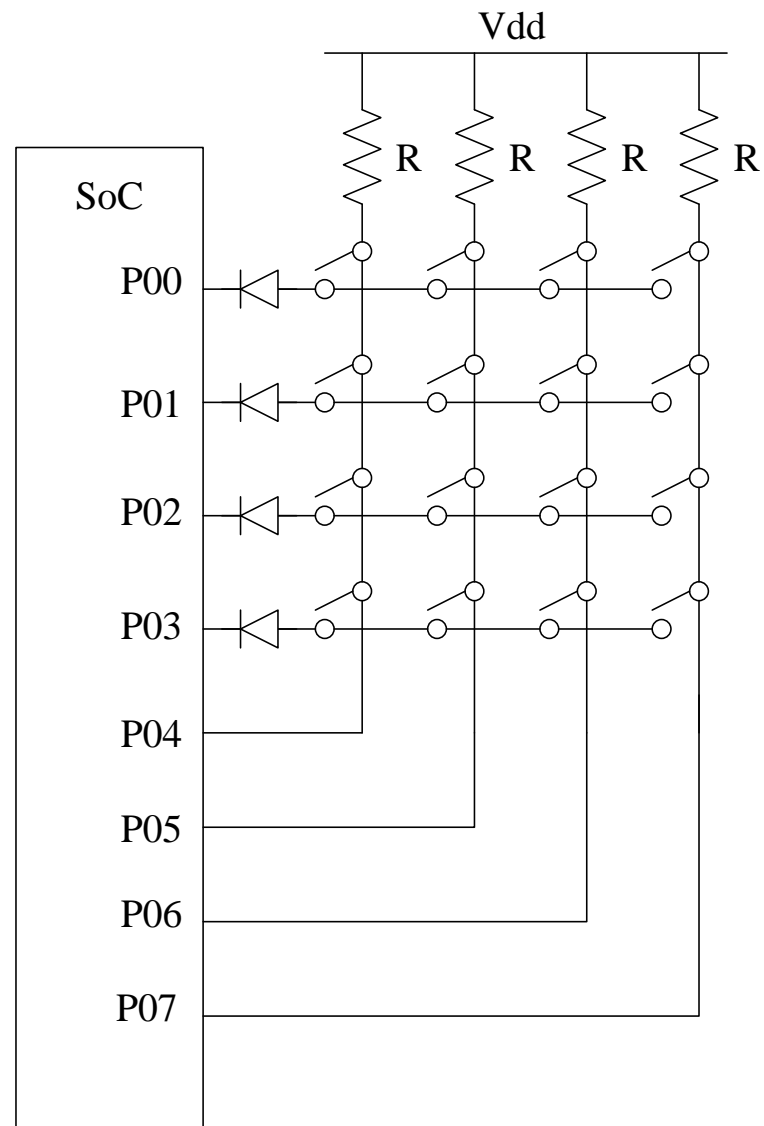
Multipleksiranje - Ideja



Multipleksiranje – Problem sa bidirekcionim portovima

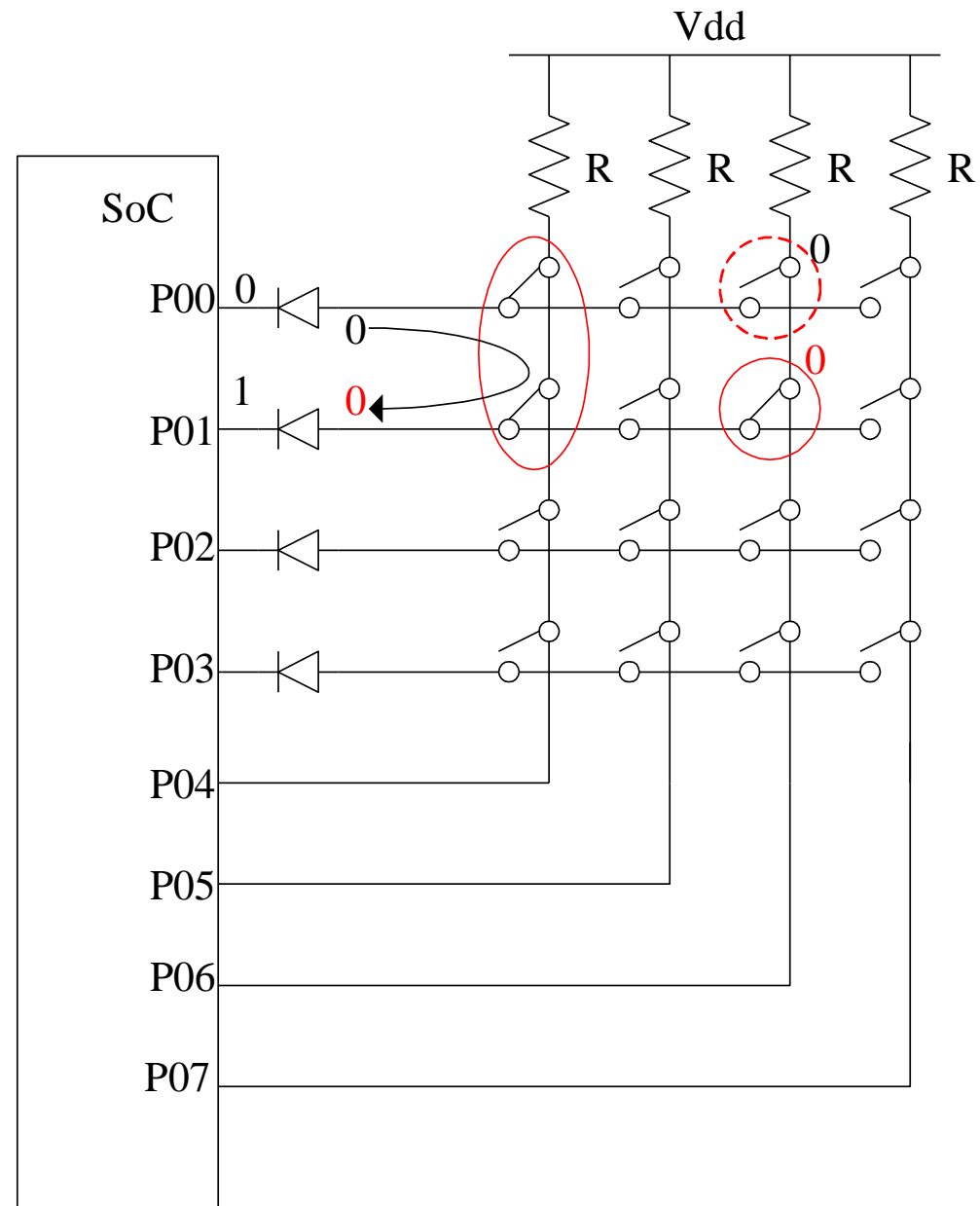


Multiplexiranje - bidirekcionni portovi – zaštitne diode

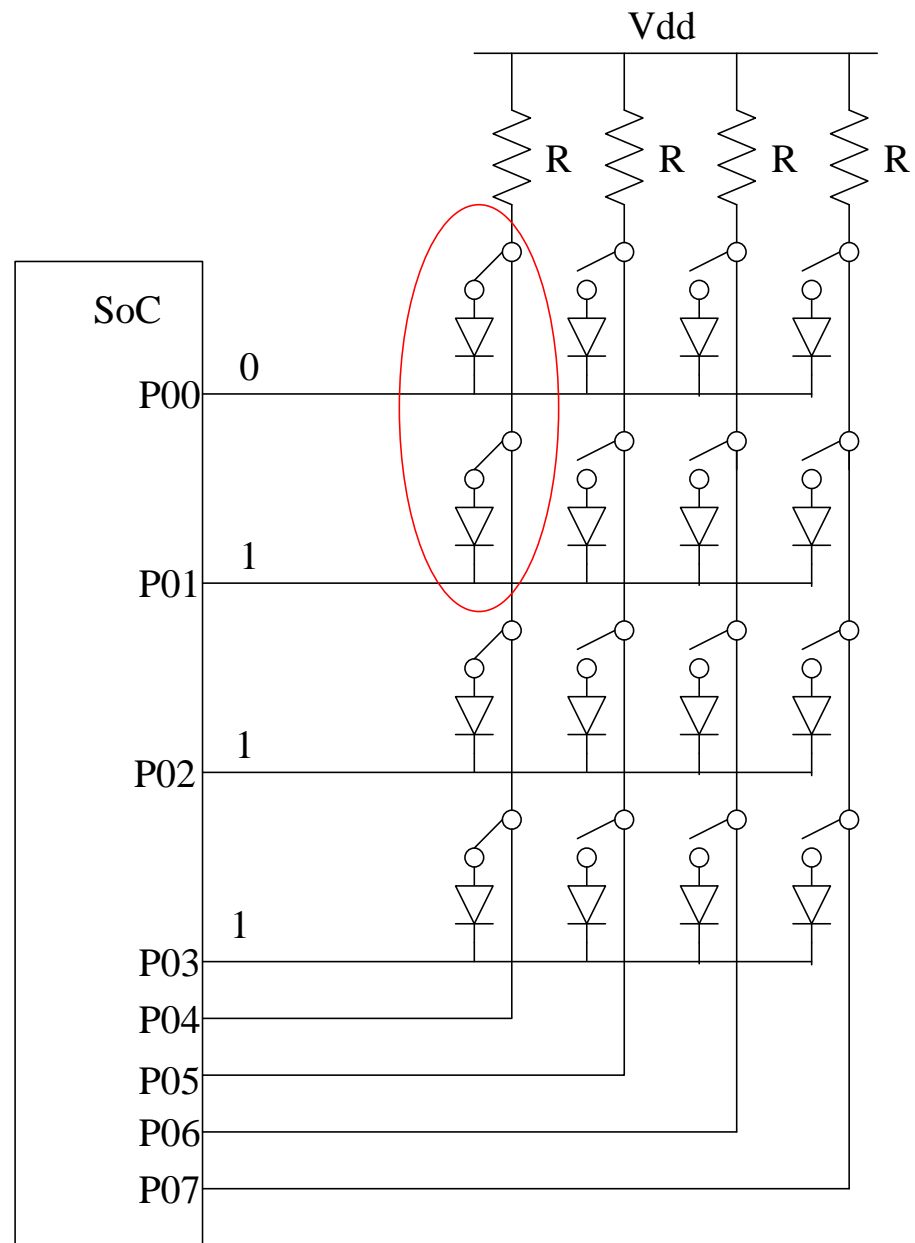


Pouzvano:

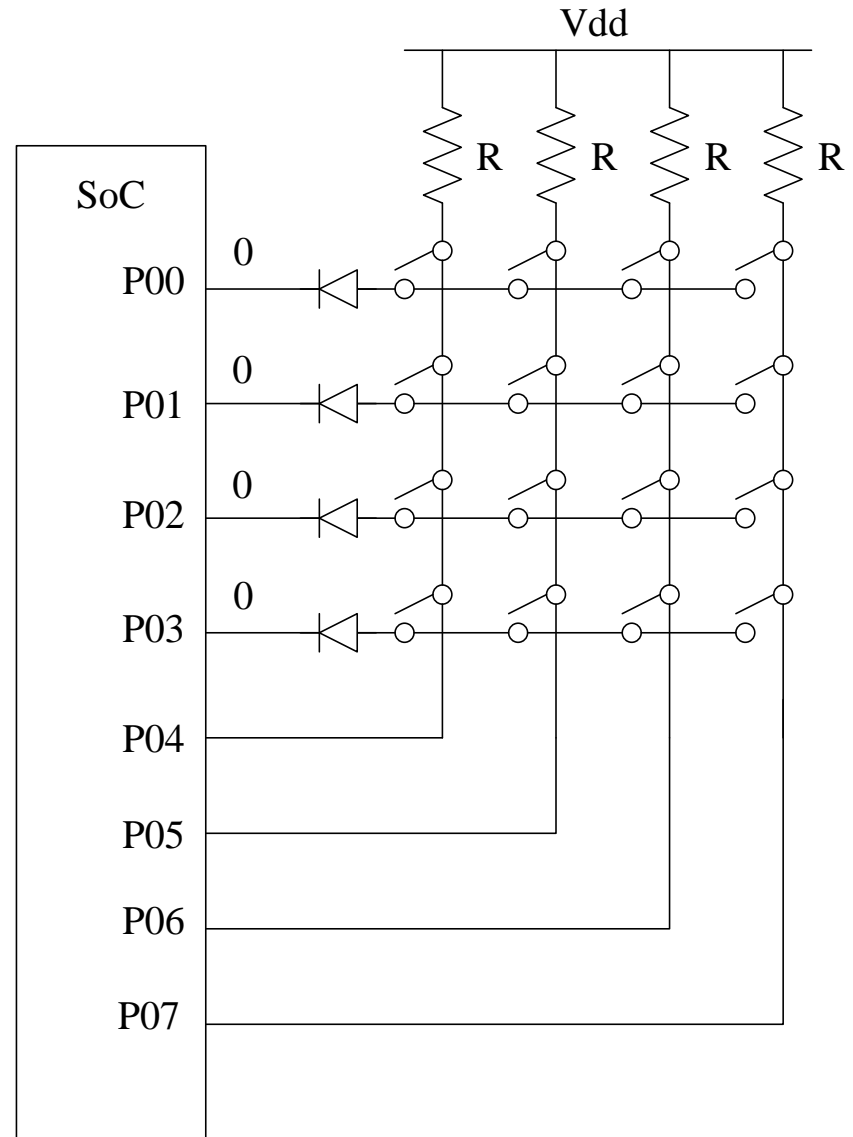
- Samo jedan
- Samo dva
- Više od dva



Pouzdana:
- Bilo koji i bilo koliko



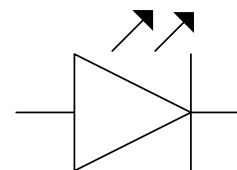
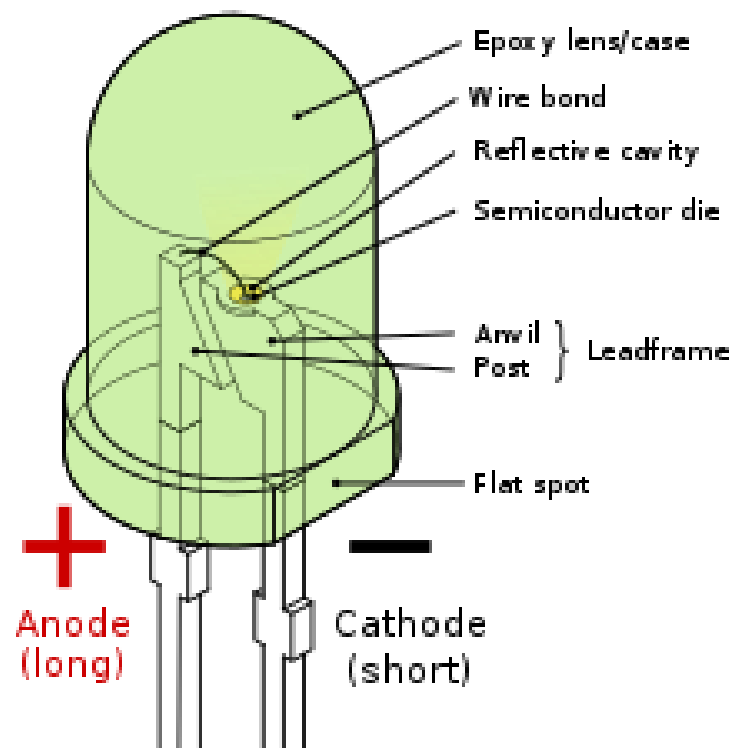
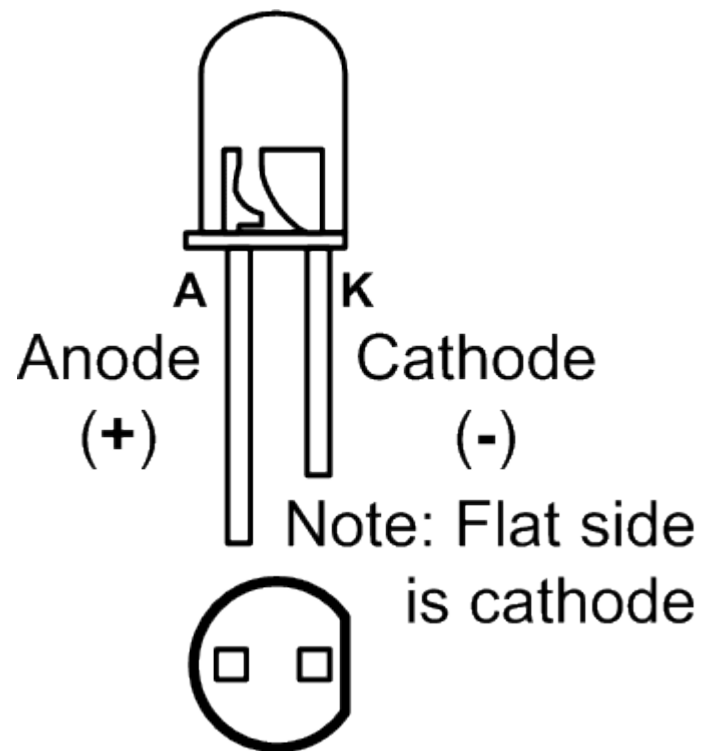
Prekid + Poliranje



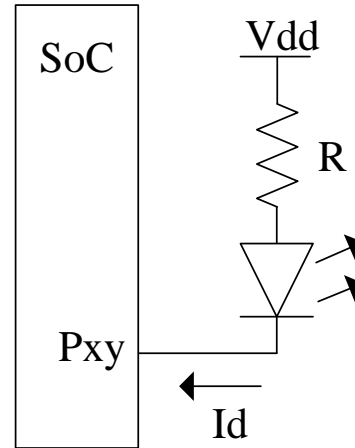
Displej



LED light-emitting diode

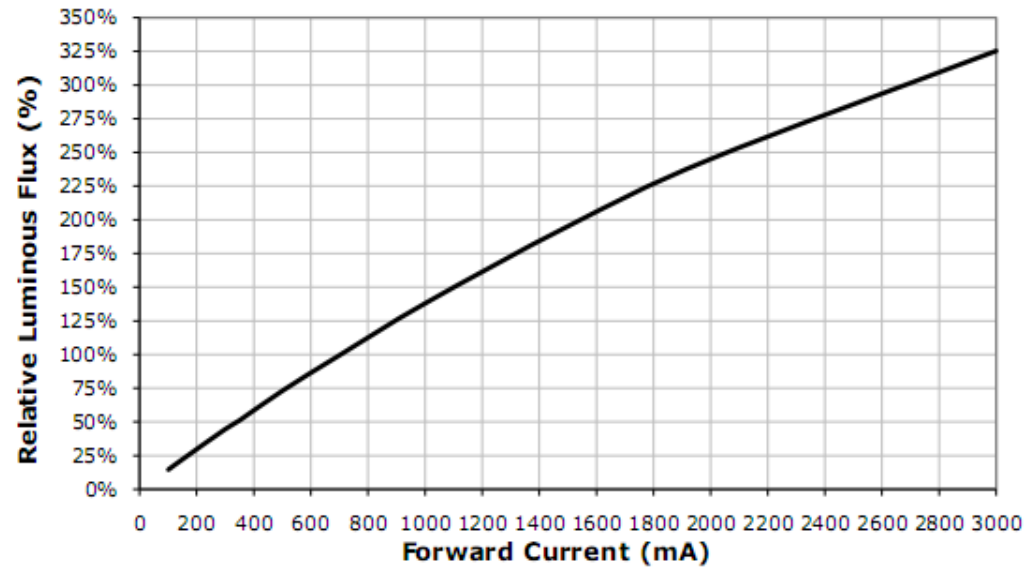


Upravljanje LED diodom

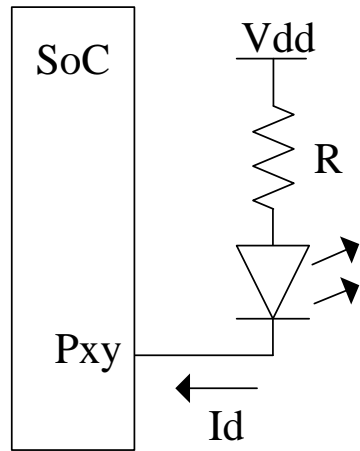


$$I_d = \frac{V_{dd} - V_D}{R}$$

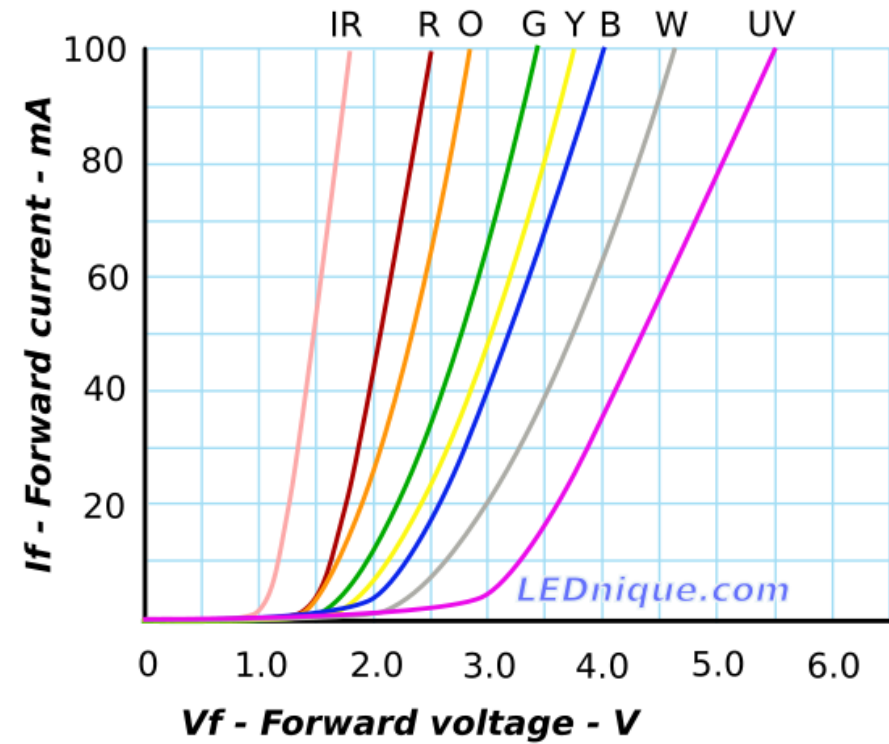
RELATIVE FLUX VS. CURRENT ($T_j = 25^\circ\text{C}$)

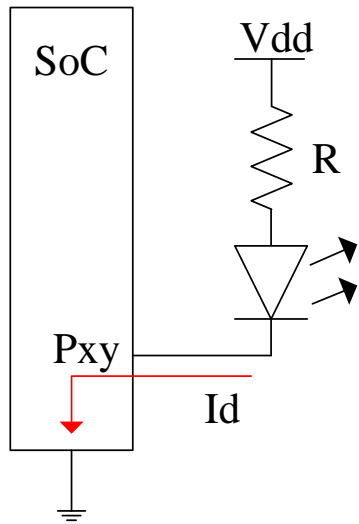


Proračun vrednosti otpornika – napon direktne polarizacije diode

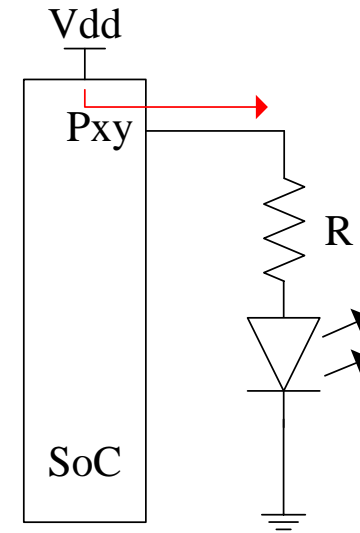


$$I_d = \frac{V_{dd} - V_D}{R}$$

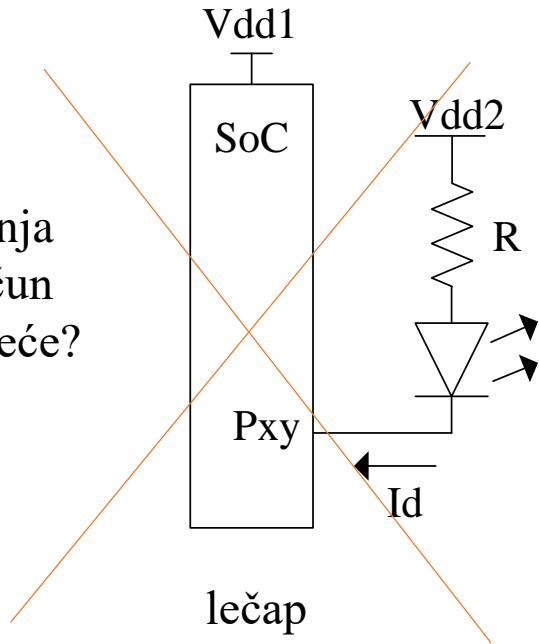




Dovoljan strujni kapacitet logičke jedinice.
Može i ovako.
Izbegava se.

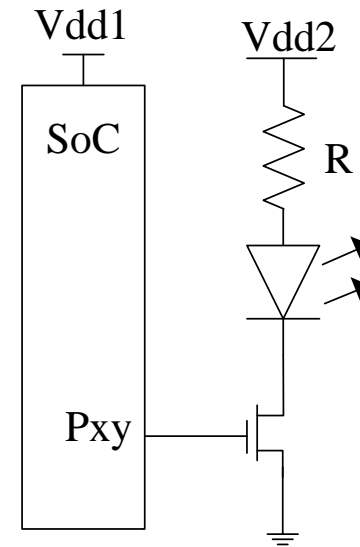


Nedovoljan napon napajanja
mikrokontrolera za proračun
Sme li drugo napajanje, veće?

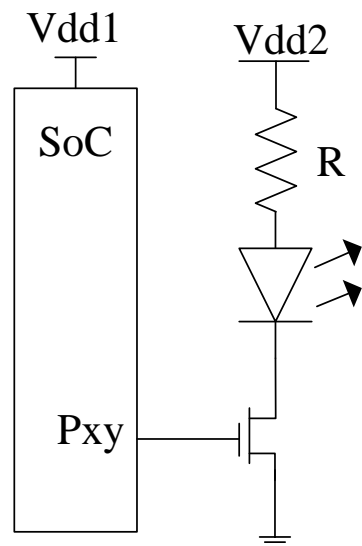


lečap

Tada mora



Promena jačine svetla

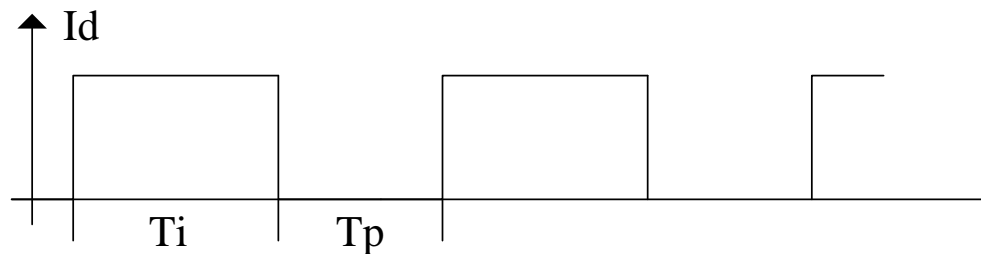
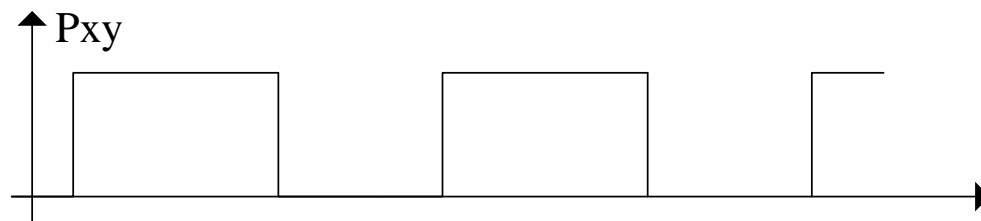


Oko oseća srednju vrednost - Integralno

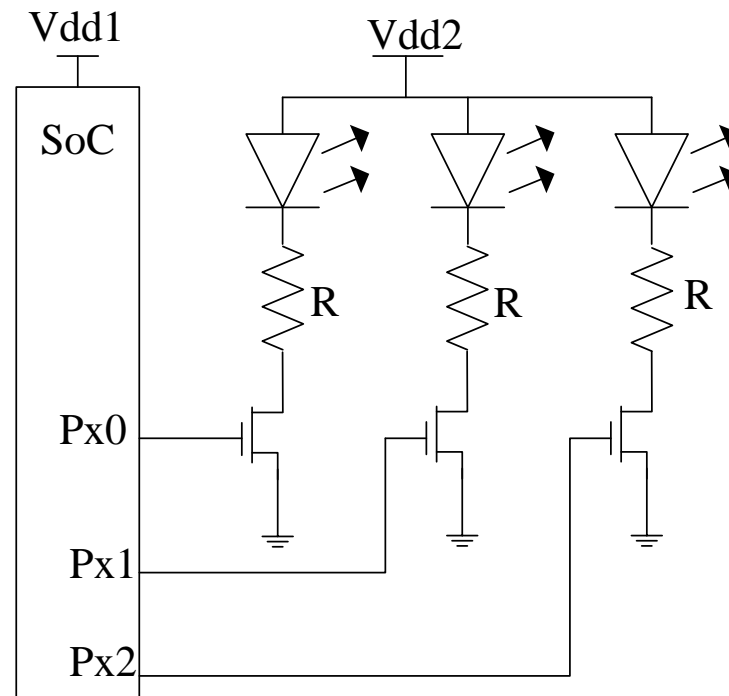
Jačina zavisi od srednje vrednosti

$$I_d = \frac{V_{dd} - V_D}{R}$$

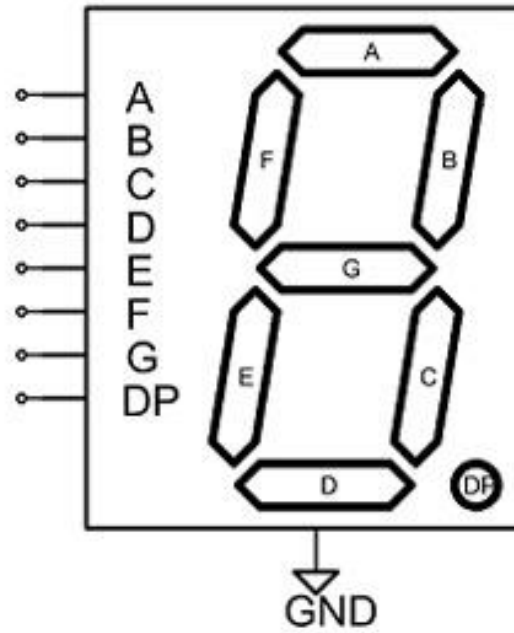
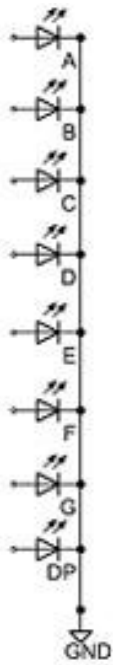
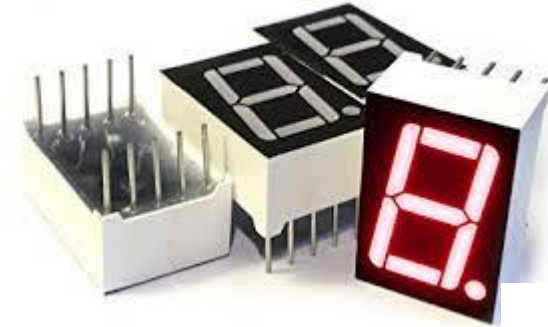
$$I_{dsr} = \frac{T_i}{T_i + T_p} \left(\frac{V_{dd} - V_D}{R} \right)$$



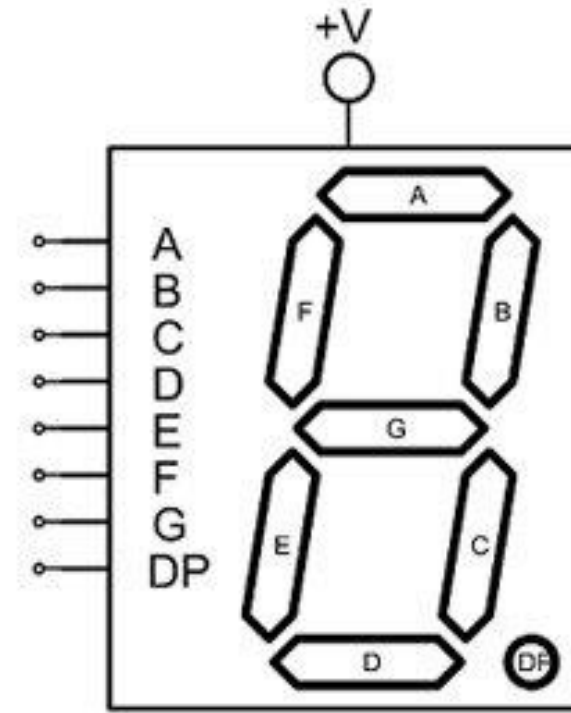
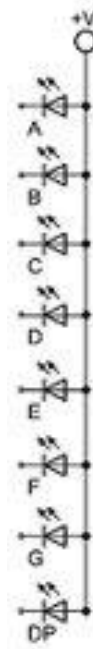
RGB LED dioda



Sedmosegmentni LED displej



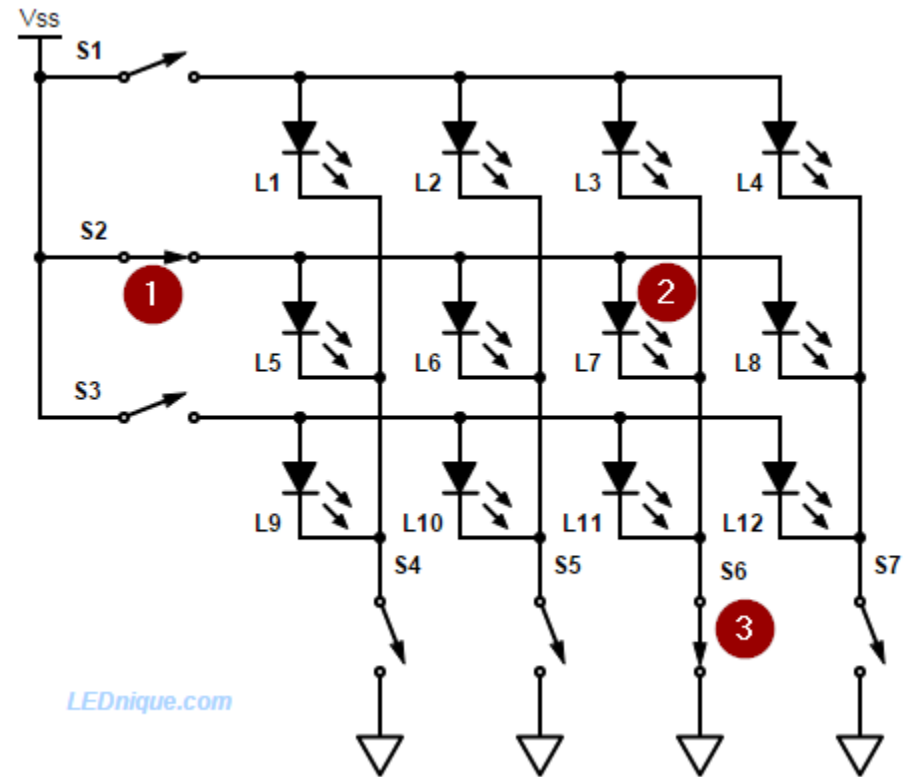
Zajednička katoda



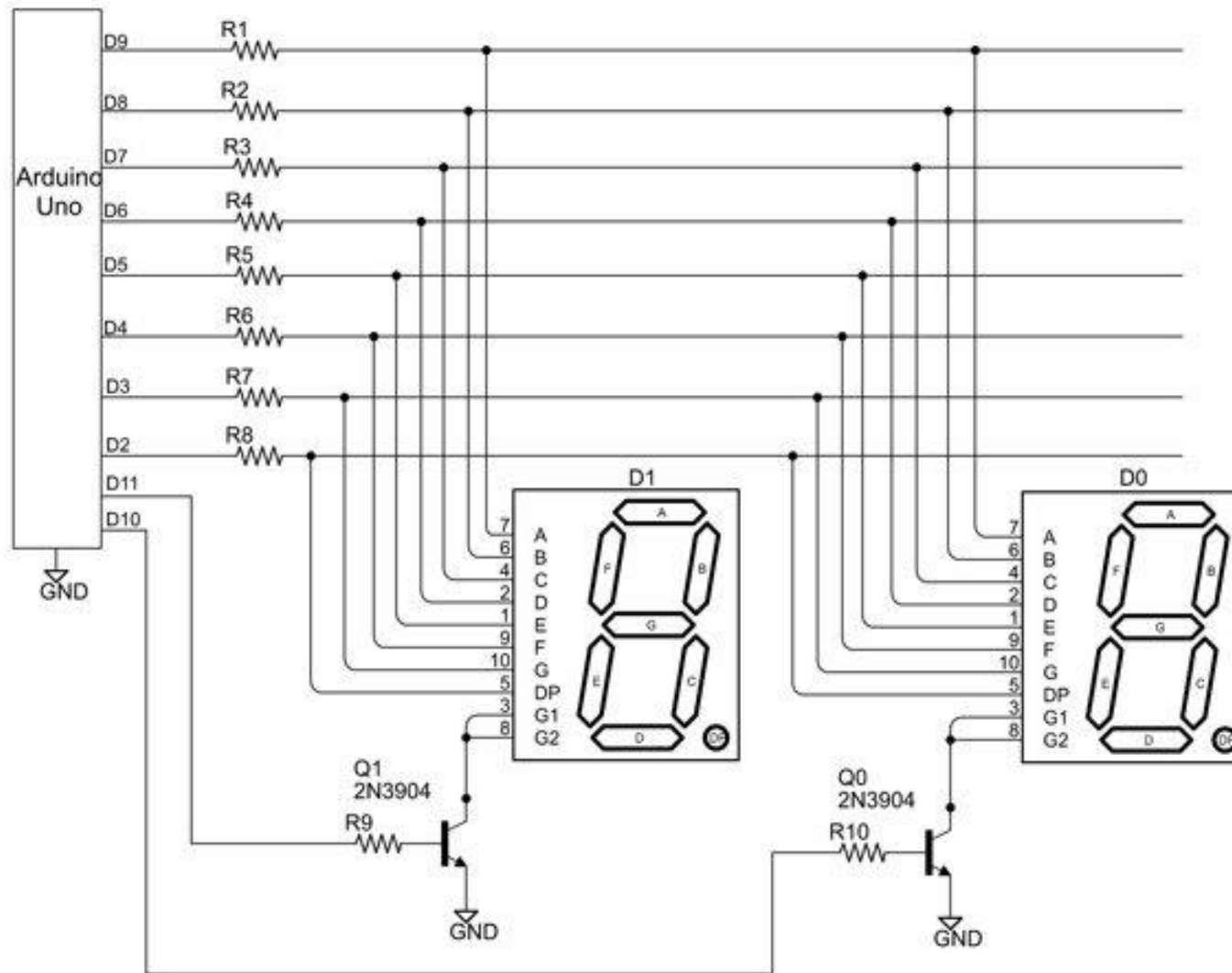
Zajednička anoda



Nedovoljan broj portova - multipleksiranje

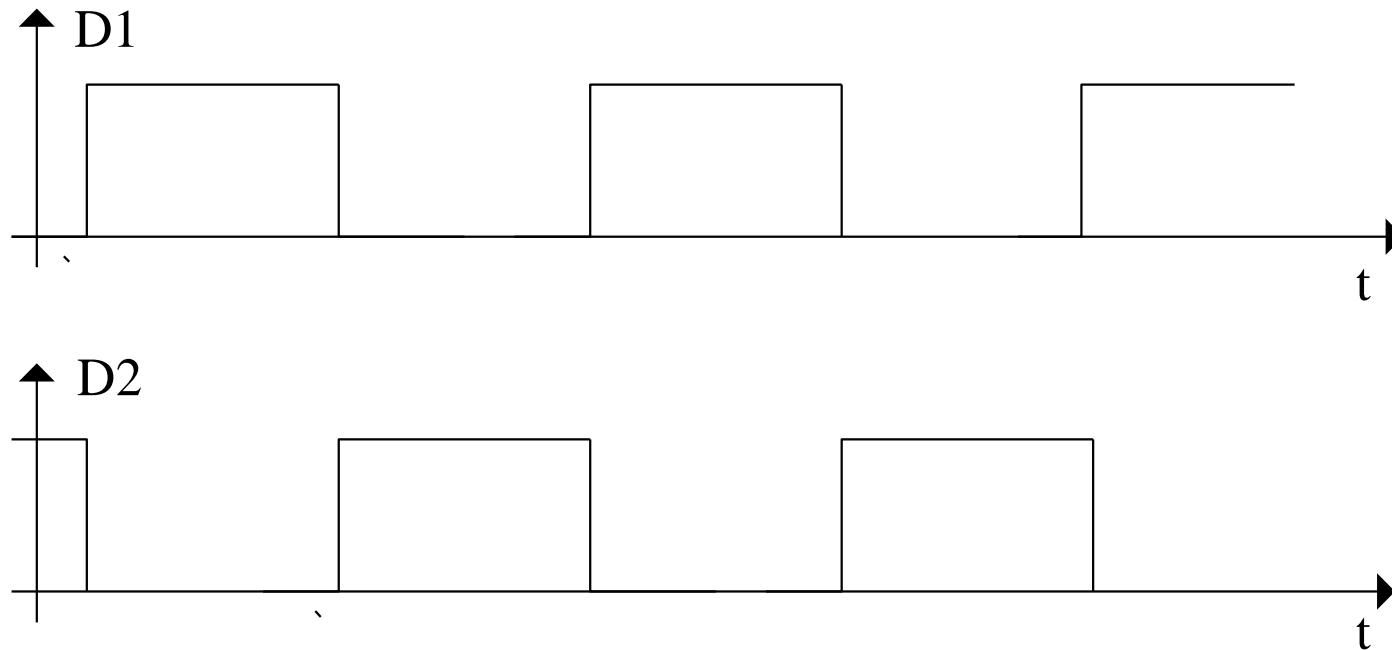


Multipleksiranje

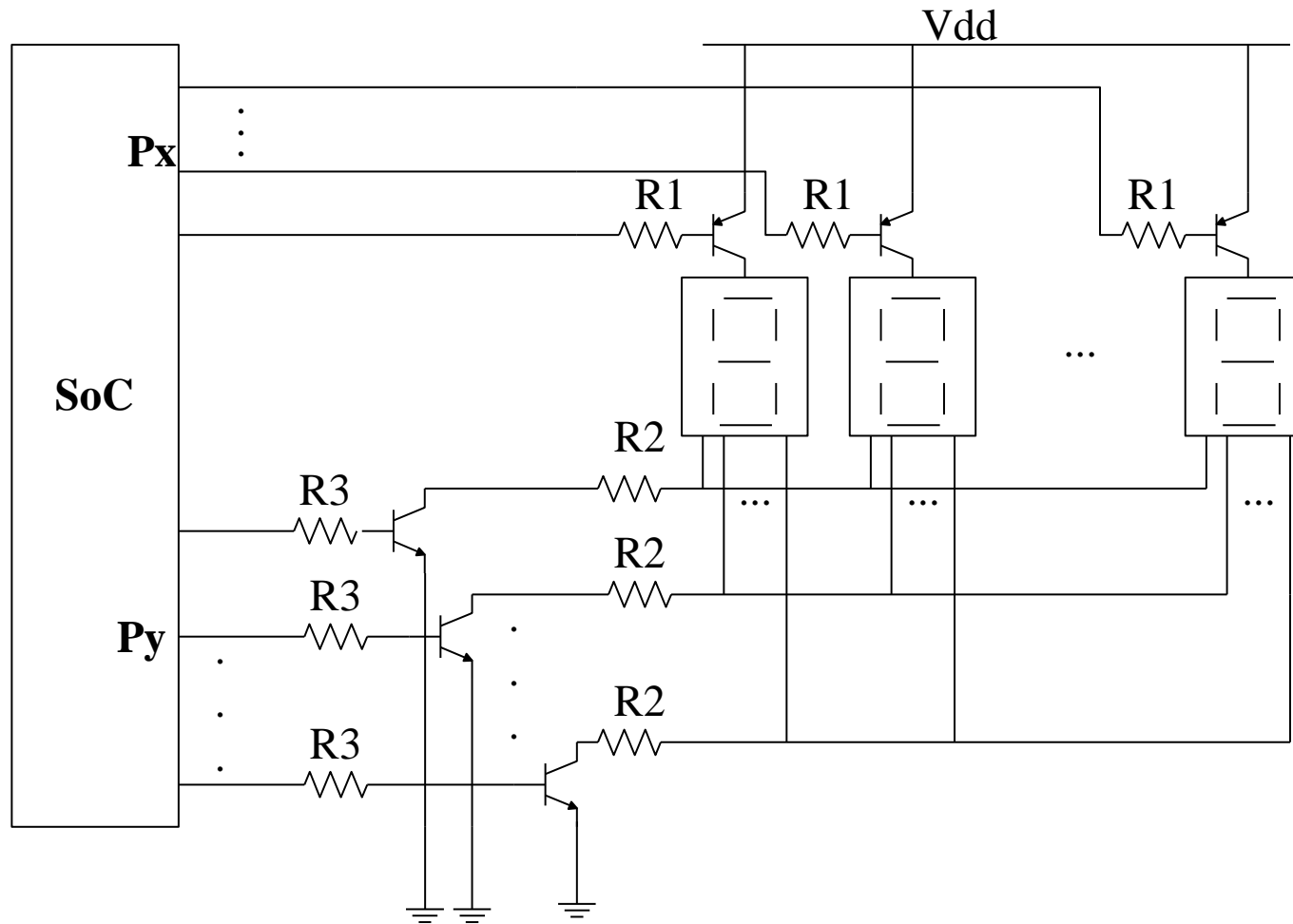


Multipleksiranje

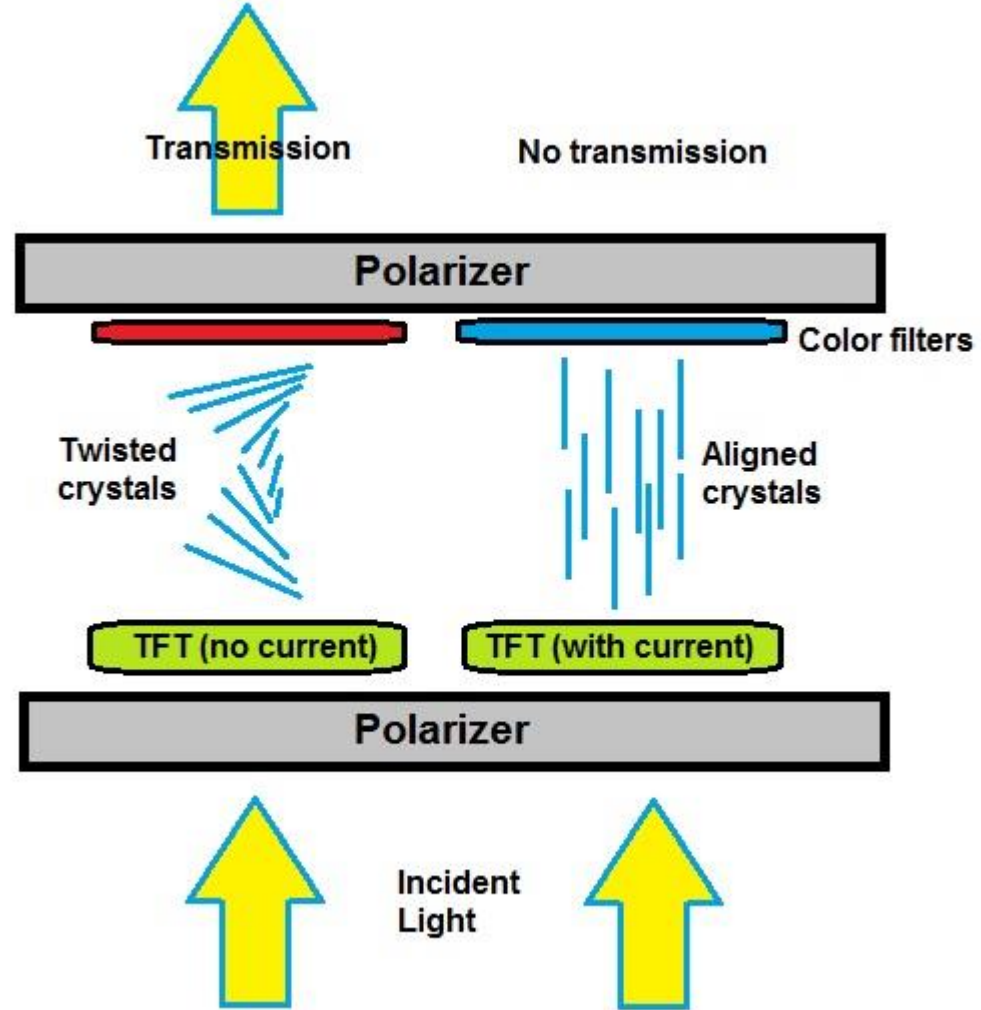
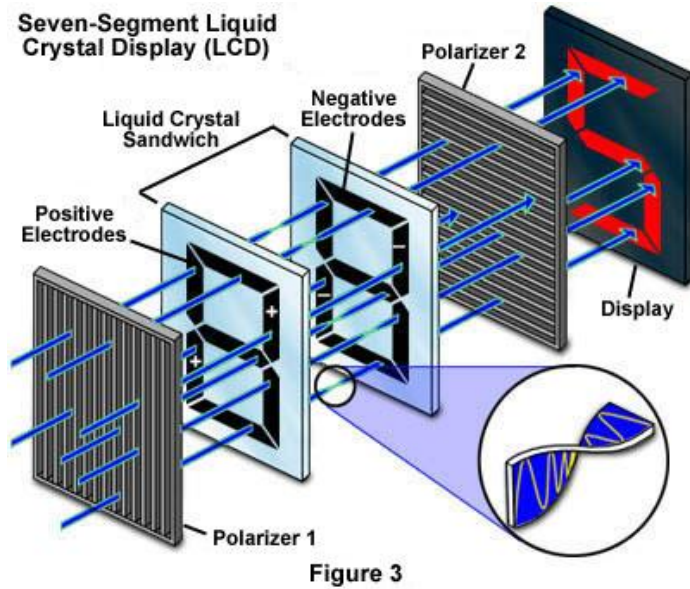
Da bi bila ista vidljivost kao i kada nije multipleksiran, struja kroz diode mora biti dva puta veća nego kod nemultipleksiranog kada se prikazuje taj displej



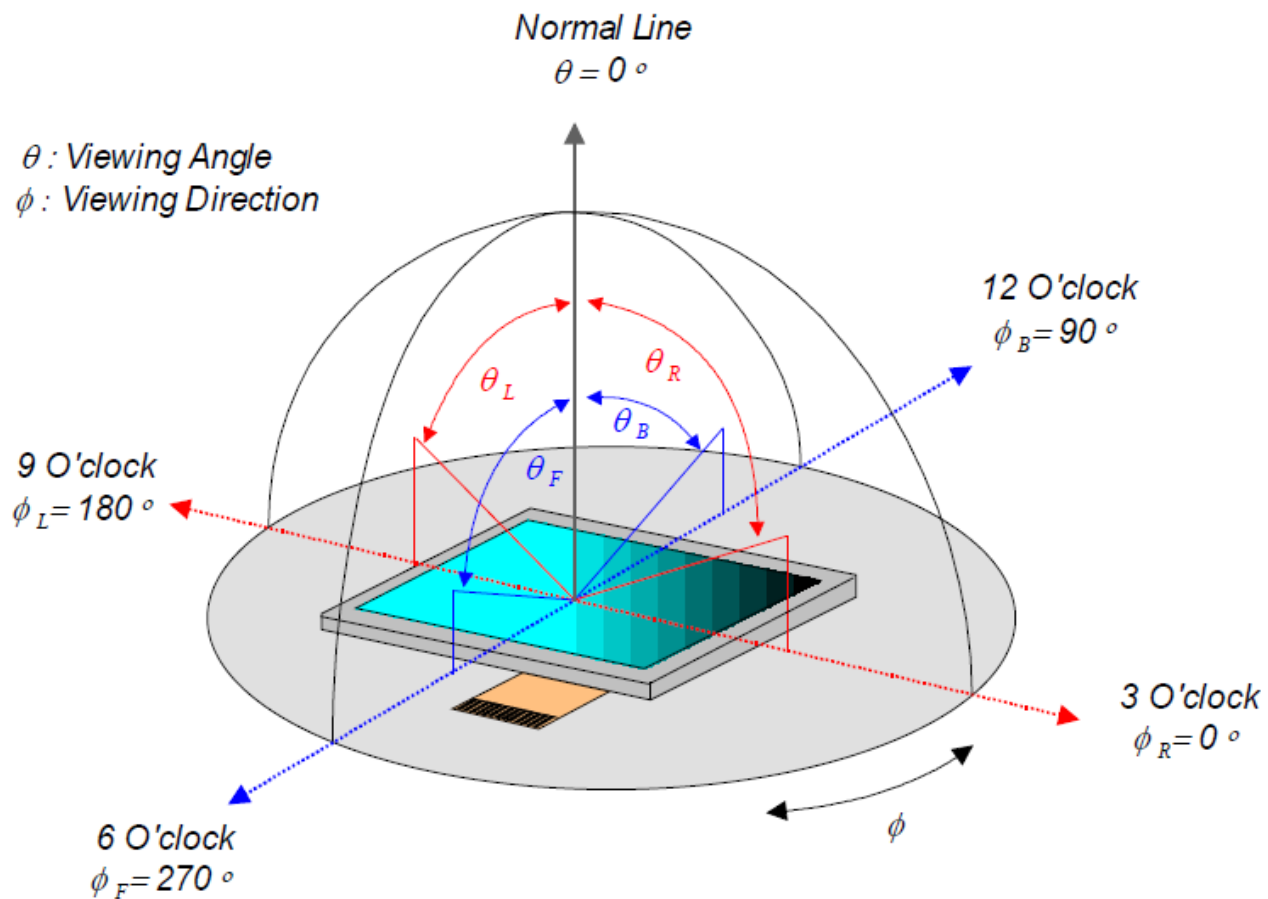
Multipleksiranje



LCD displej



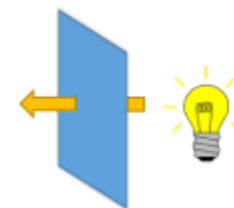
Jedna od bitnih stvari za LCD



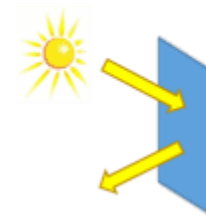
Prave se i kupuju za odgovarajući ugao iz kojeg se najbolje vide

Mora „dodatni“ izvor svetlosti

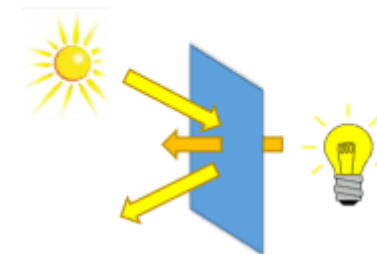
Transmissive Type



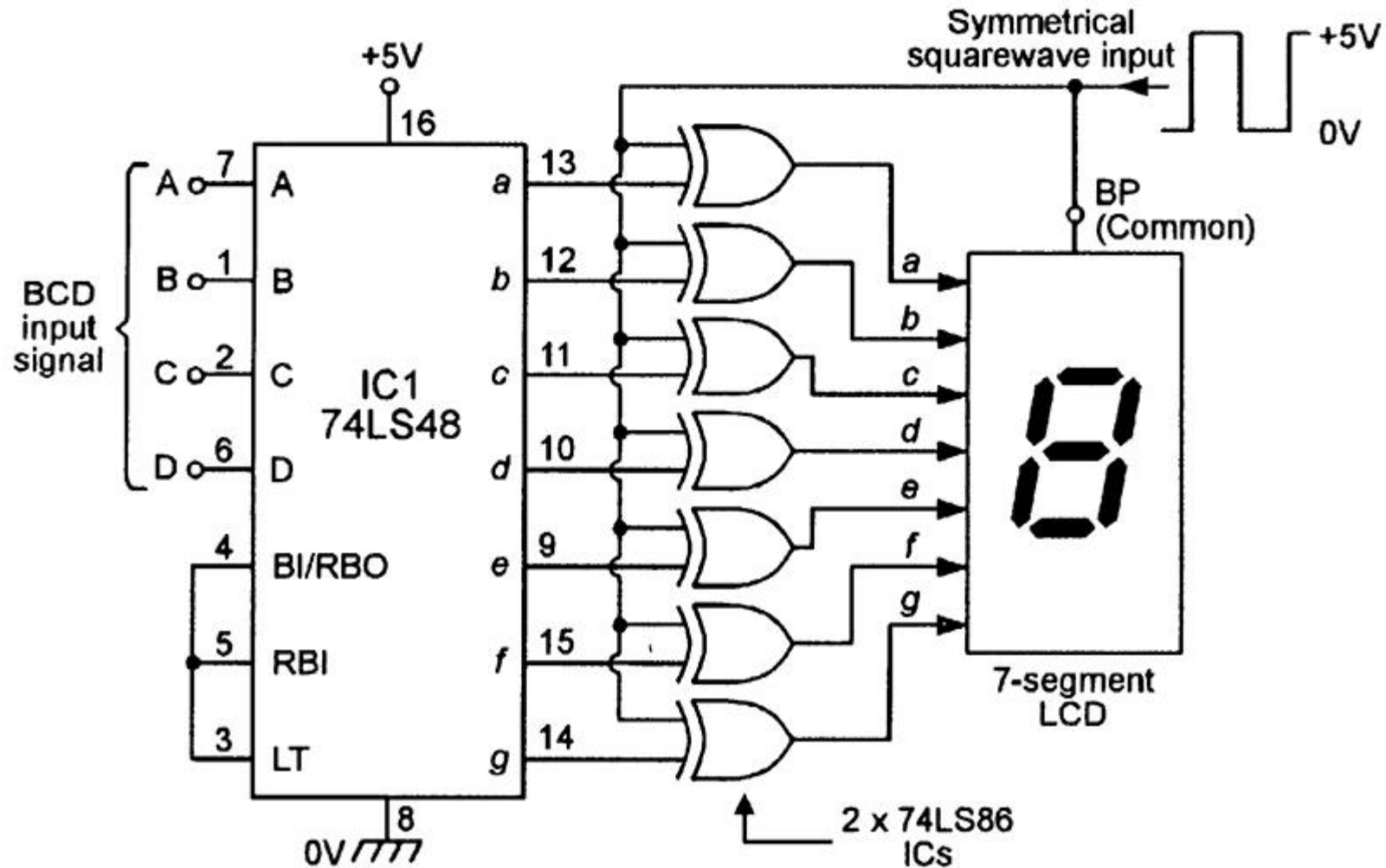
Reflective Type



Transflective Type



Nemultipleksiran sedmosegmentni LCD displej



Segmenti „ne trpe“ stalne jednosmerne polarizacije.
Ostaju stalno polarizovani. Mora naizmeničan napon.



Potrebni naponi za četverostruko multipleksirani LCD displej

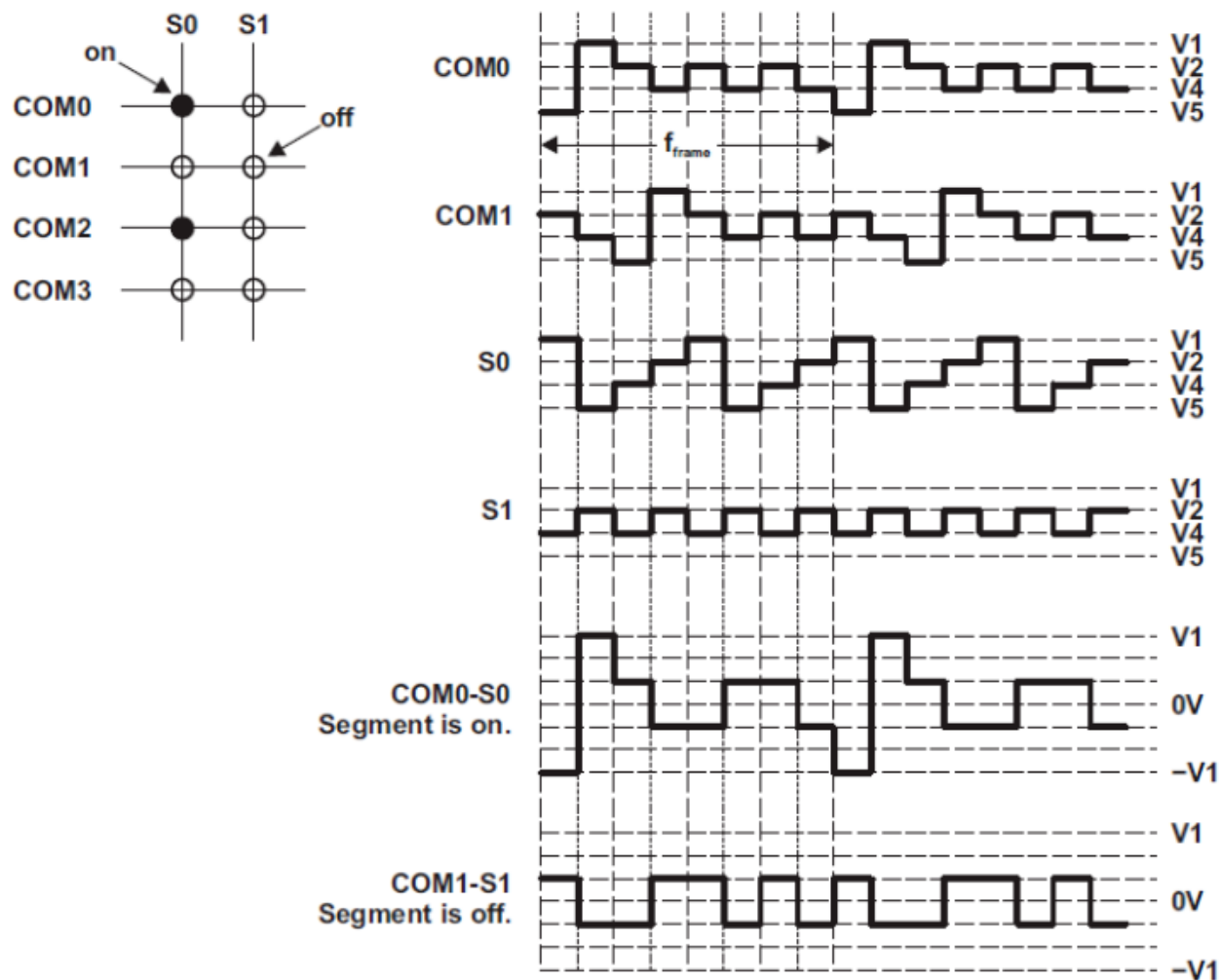


Figure 3. 4-Mux Connections and Waveforms



Zaključak

LED

1. Vidljivi u “svim” uslovima, izvori su svetlosti
2. Rade u ekstremnim temperaturnim uslovima
3. **Veliki potrošači energije**

LCD

1. Izuzetno mali potrošači energije
2. **Potreban dodatni izvor svetlosti**
3. **Nisu vidljivi u „svim“ uslovima**
4. **Specifičan napon upravljanja segmentima, poseban hardver**
5. **Ne mogu da rade u ekstremnim temperaturnim uslovima**
6. **Relativno kratak životni vek**

Da li je bolji LED (malo crveno) ili LCD (puno crveno)?

