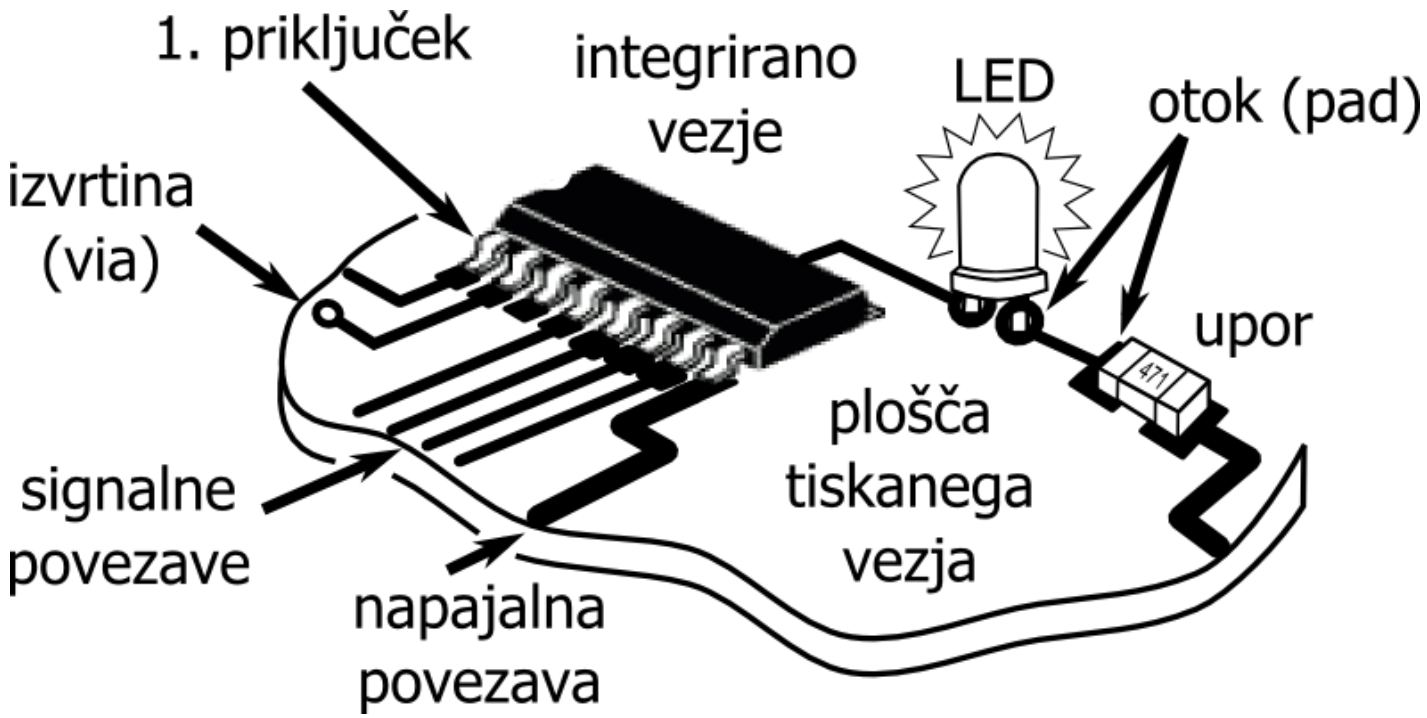
Digitalni Elektronski Sistemi

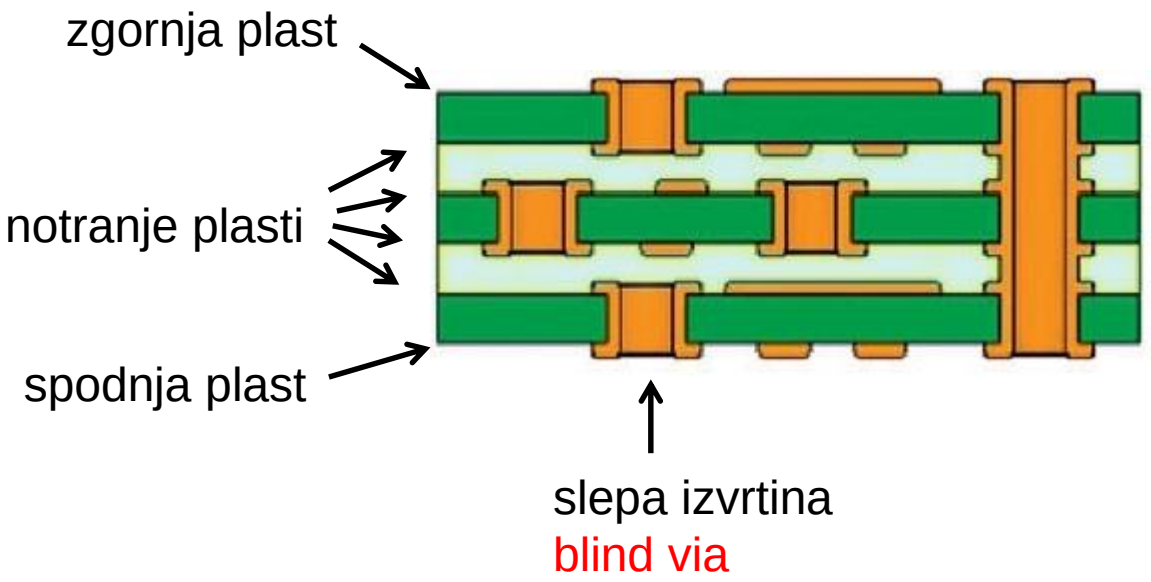
Načrtovanje tiskanega vezja

Tiskano vezje (Printed Circuit Board)



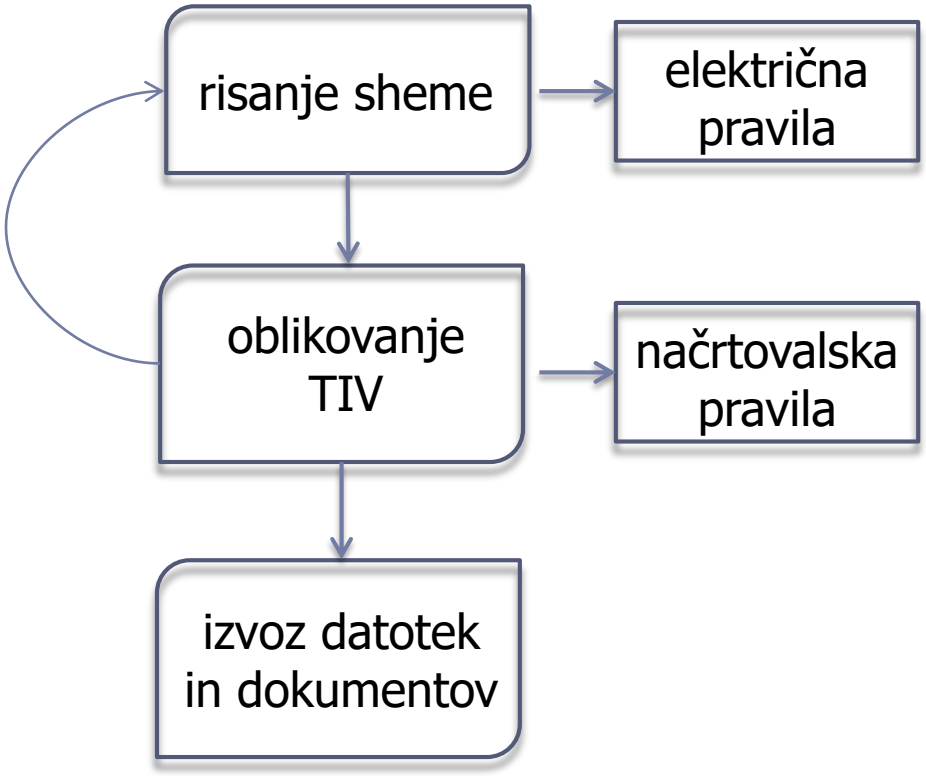
Plošča tiskanega vezja

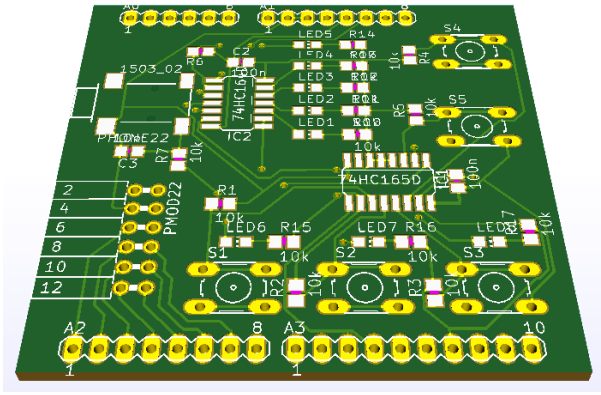
- izolativen material prevlečen z bakreno folijo
  - FR-4 (vitroplast), steklena vlakna+epoksi
- število bakrenih plasti:
  - enoplastna – majhna vezja, analogna, domača izdelava
  - dvoplastna – najbolj razširjena, poceni
  - večplastna – zahtevna digitalna vezja, narejena z lepljenjem



Načrtovanje tiskanega vezja

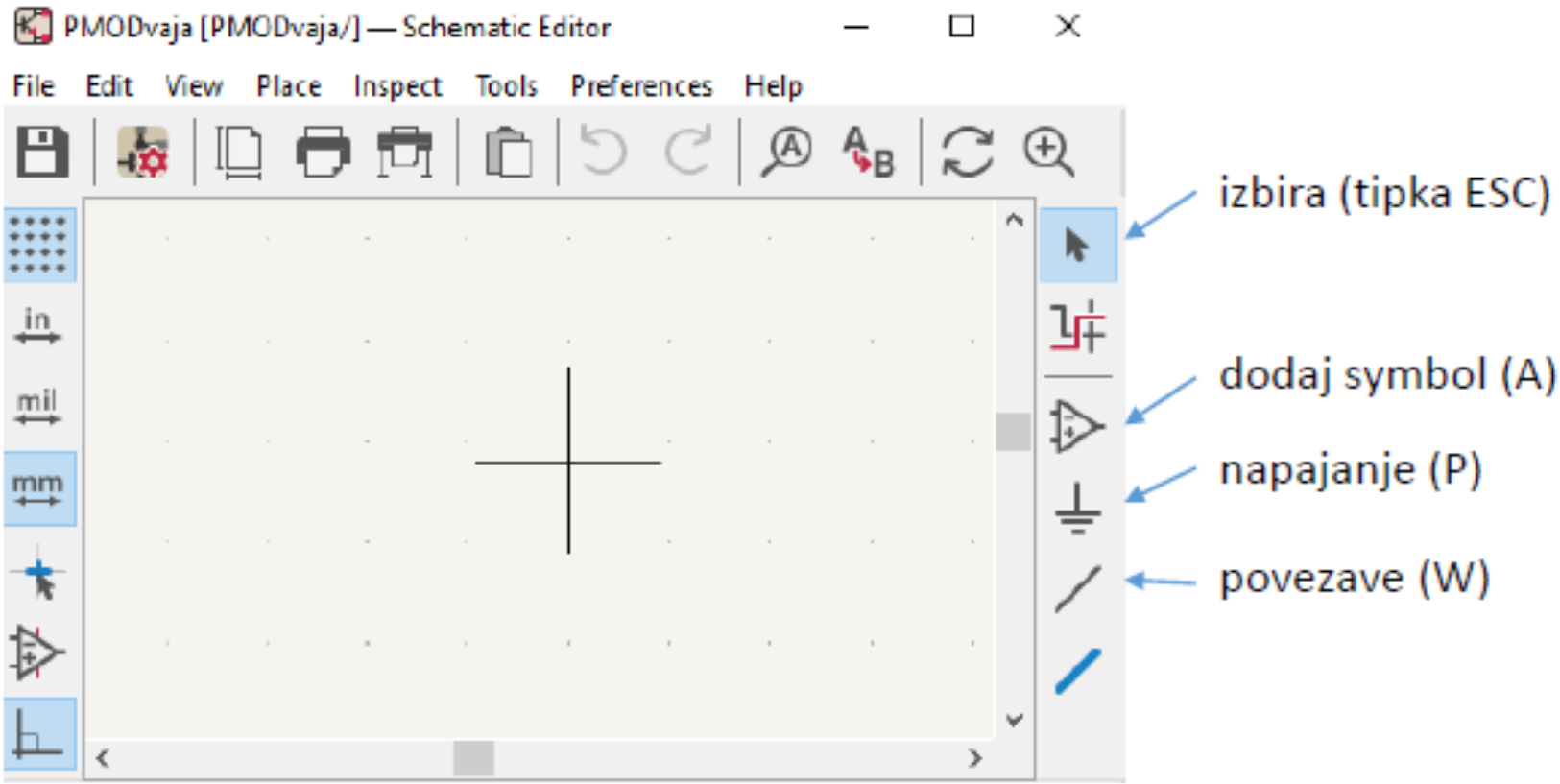
- Orodja za računalniško podprto načrtovanje : Altium, Eagle, **KiCad**…





Risanje sheme - KiCAD

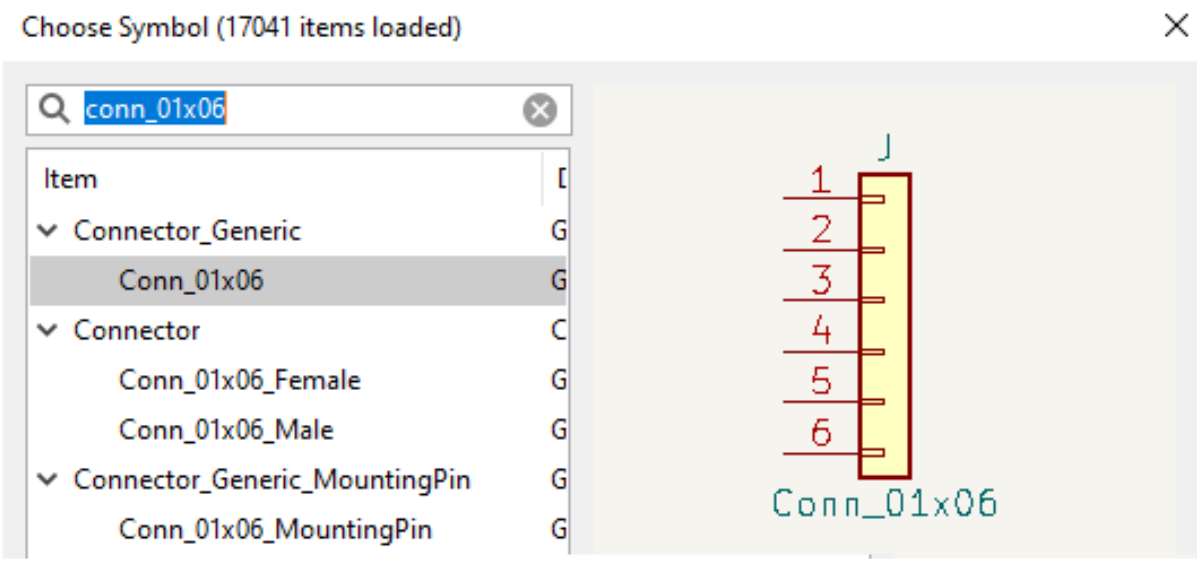
1. Dodaj na list simbole elementov (tipka A) in napajanje (P).
   Simbol zavrtimo s tipko R, zrcalimo z X ali Y in premikamo z M oz. G.
2. Določi imena in vrednosti posameznih elementov (U, V) ali izberi avtomatsko
3. Nariši povezave (W), spoje (J) in oznake (L).
4. Preveri shemo (Electrical Rules Check) in popravi napake.
5. Določi ohišja elementov (Assign PCB Footprints).



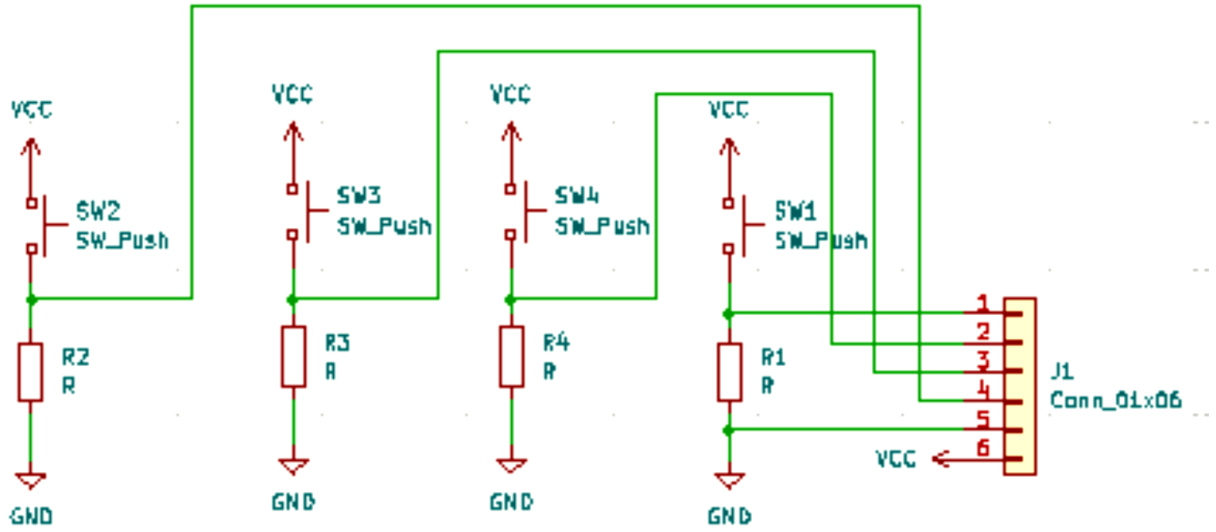
1. Shematski simboli

IME SIMBOLA

letvica : Conn_01x06
upor : R
tipka : SW_Push

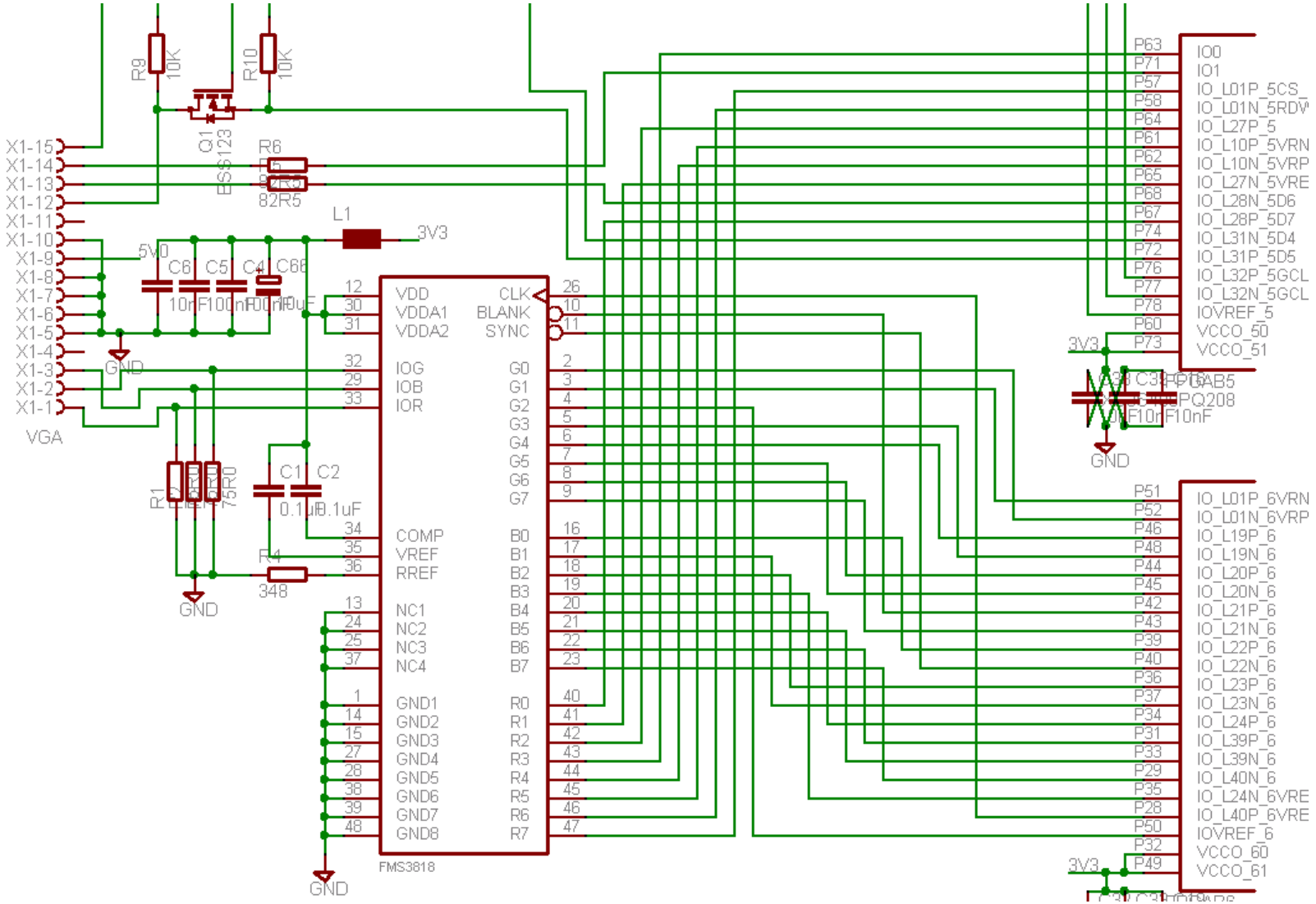


2. Simbolom določimo imena (in vrednosti)



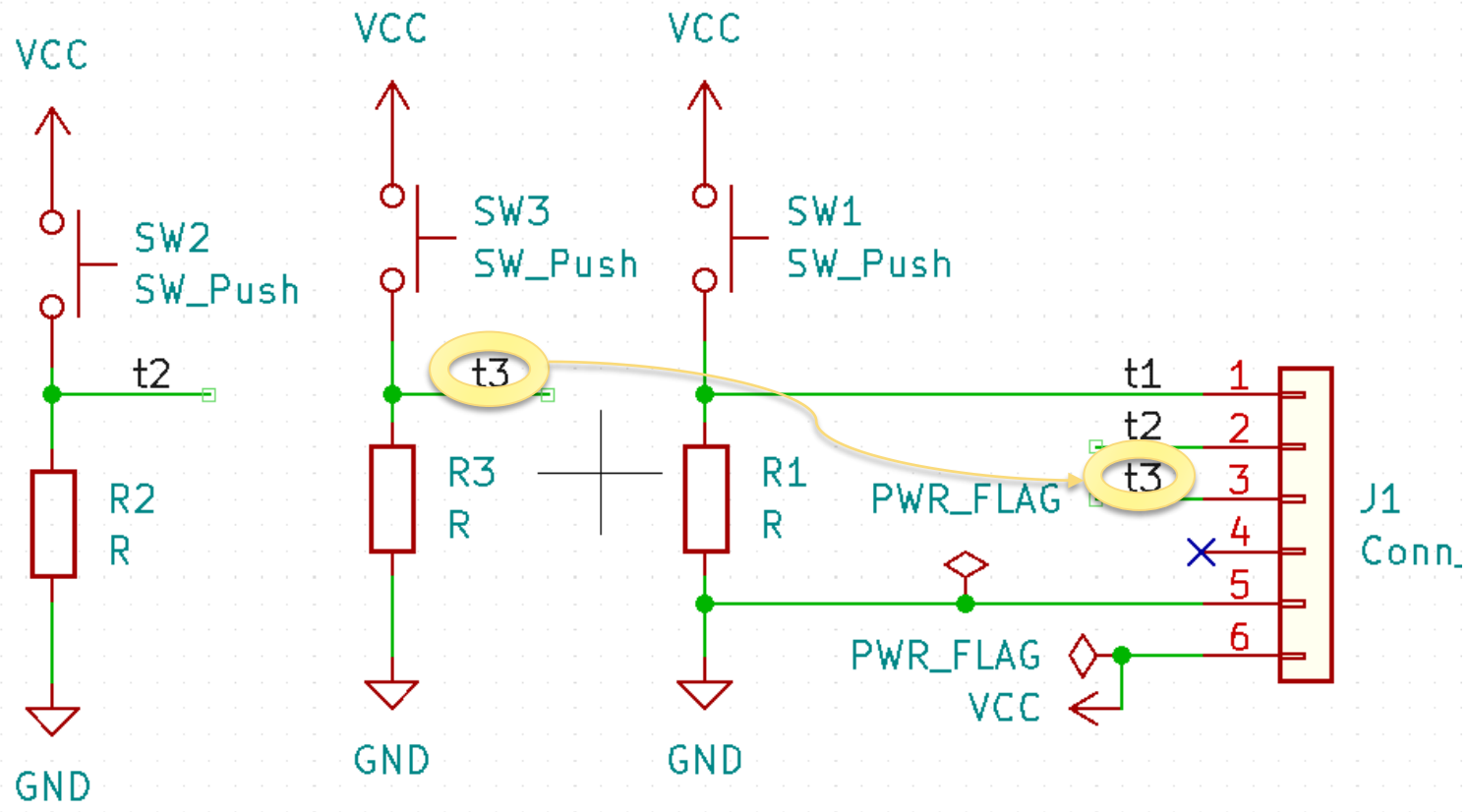
3. Povezave – slabo

- v digitalnih shemah je veliko povezav !



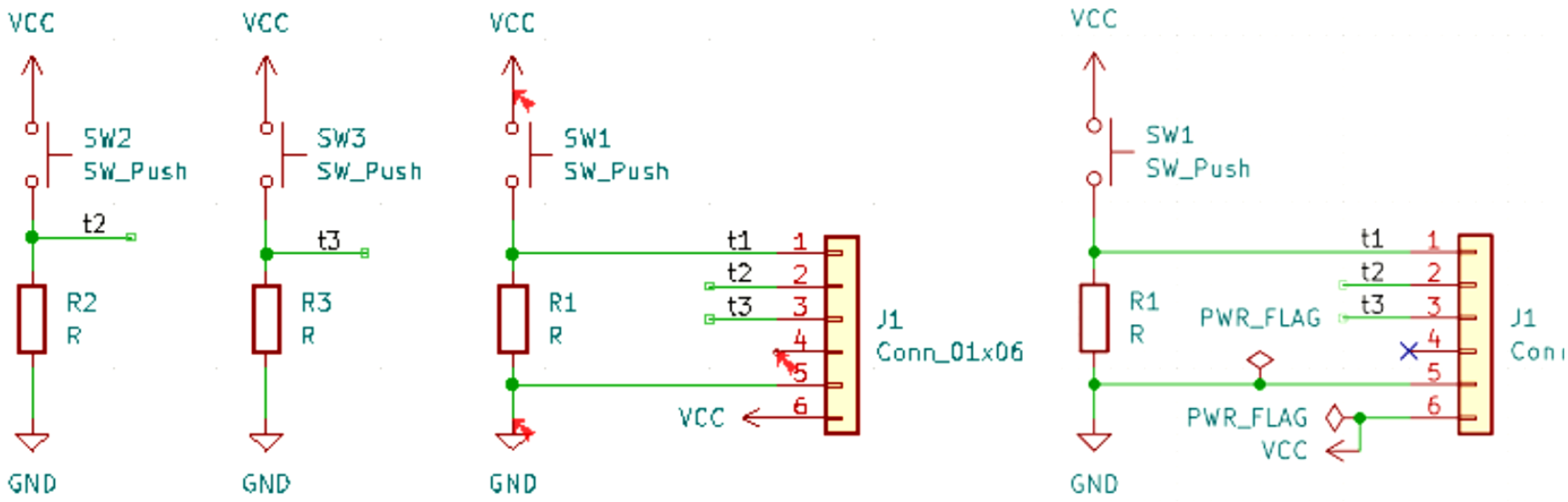
3. Povezave – dobro

- signale poimenujemo in ne povezujemo direktno



4. preverjanje sheme

- Electrical rules check preveri pravila risanja sheme
  - nepovezani signali, kratek stik izhodov, povezave napajanja...

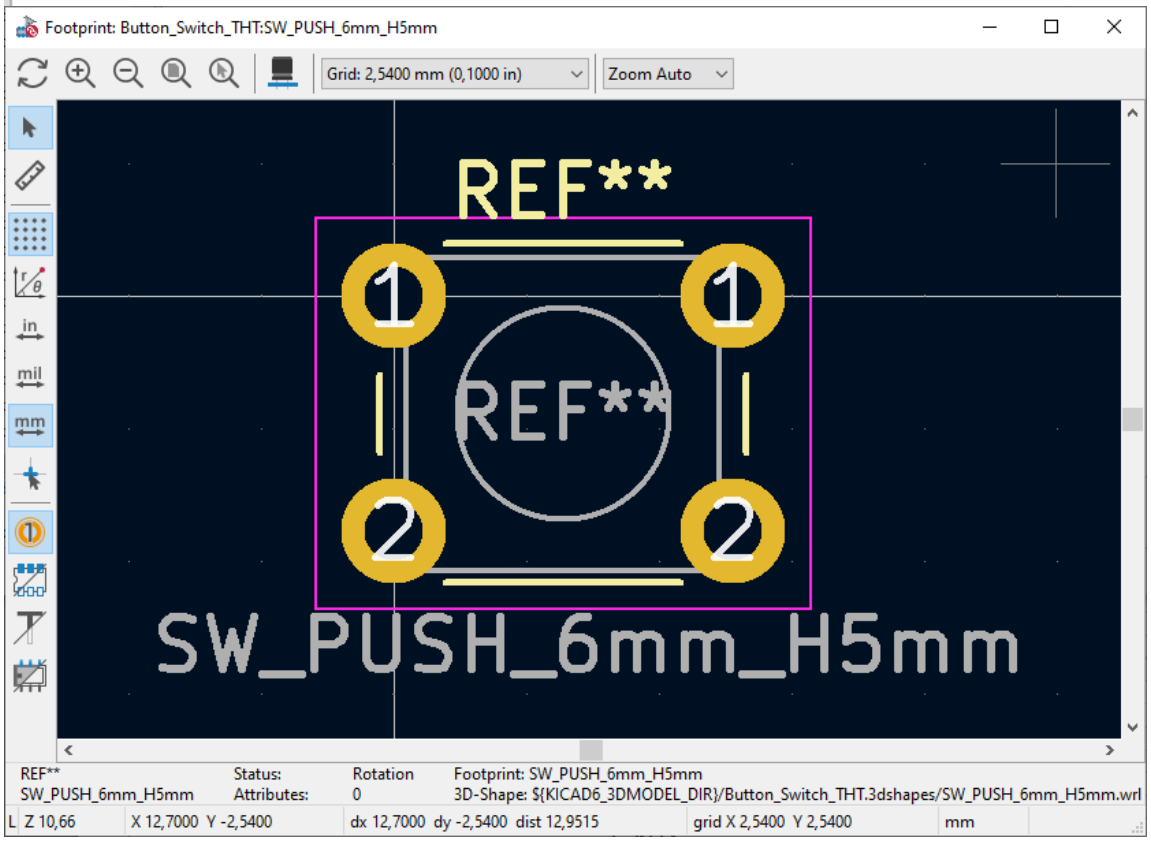


  - napajanje označimo s PWR_FLAG, nepovezane priključke pa z X

5. Določitev ohišij elementov

Symbol : Footprint Assignments		
1	J1 -	Conn_01x06 : Connector_PinHeader_2.54mm:PinHeader_1x06_P2.54mm_Verti
2	R1 -	R : Resistor_SMD:R_0805_2012Metric
3	R2 -	R : Resistor_SMD:R_0805_2012Metric
4	R3 -	R : Resistor_SMD:R_0805_2012Metric
5	SW1 -	SW_Push : Button_Switch_THT:SW_PUSH_6mm_H5mm
6	SW2 -	SW_Push : Button_Switch_THT:SW_PUSH_6mm_H5mm
7	SW3 -	SW_Push : Button_Switch_THT:SW_PUSH_6mm_H5mm

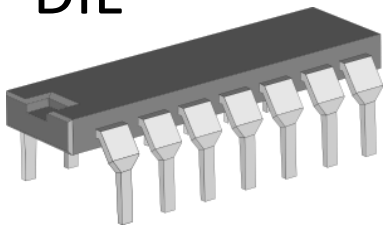
Filtered Footprints	
6	Button_Switch_SMD:SW_Push_1P1T_NO_Ve
7	Button_Switch_SMD:SW_SPST_B3S-1000
8	Button_Switch_SMD:SW_SPST_B3SL-1002P
9	Button_Switch_SMD:SW_SPST_B3SL-1022P
10	Button_Switch_SMD:SW_SPST_B3U-1000P
11	Button_Switch_SMD:SW_SPST_B3U-1000P-I
12	Button_Switch_SMD:SW_SPST_B3U-3000P
13	Button_Switch_SMD:SW_SPST_B3U-3000P-I
14	Button_Switch_SMD:SW_SPST_CK_RS282G0
15	Button_Switch_SMD:SW_SPST_FSMSM
16	Button_Switch_SMD:SW_SPST_TL3342
17	Button_Switch_THT:SW_MEC_5GTH9
18	Button_Switch_THT:SW_PUSH_6mm_H4.3mm
19	Button_Switch_THT:SW_PUSH_6mm_H5mm



Dimenzije elektronskih komponent

Enote: mm ali mils (1/1000 "), 1mm = 39.37 mils

DIL



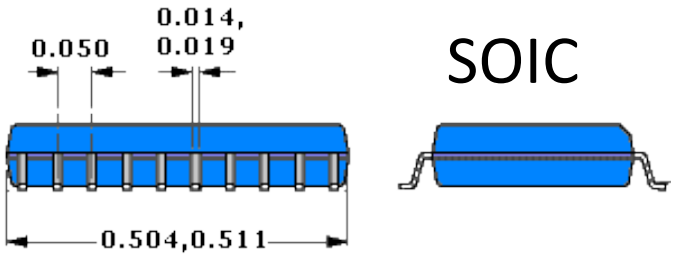
razmak 100 mils (2.54 mm)

- povezave 10-20 mils
- izvrtine 0.6-1 mm

TQFP

razmak 0.5 mm (19.7 mils)

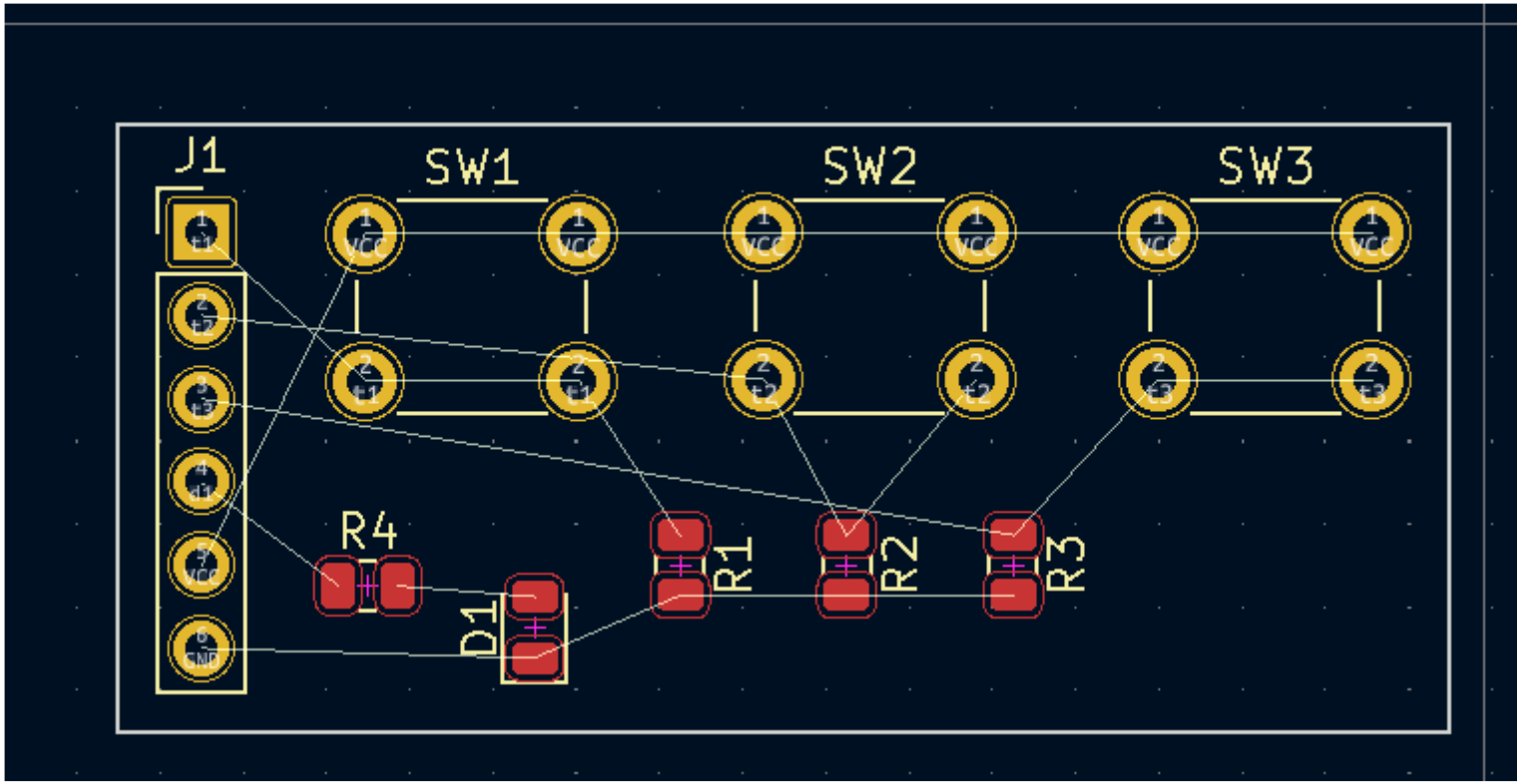
- povezave 8-12 mils



SOIC

Oblikovanje tiskanega vezja

1. razmestitev elementov in določitev robov
2. nastavitev lastnosti povezav
3. povezovanje (route) in preverjanje pravil
4. izvoz proizvodnih datotek (gerber)

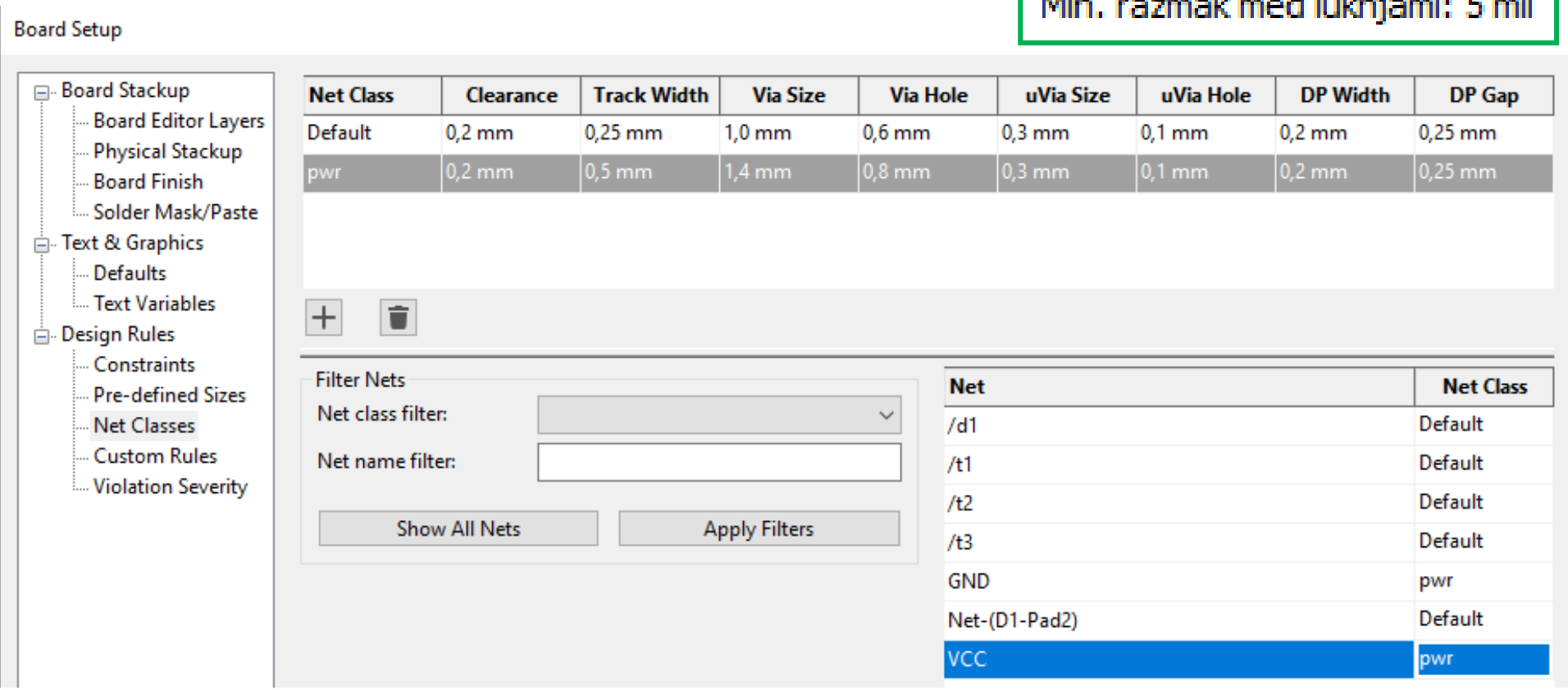


2. nastavitev lastnosti povezav

- upoštevamo lastnosti vezja in proizvodne tehnologije
- napajalne povezave močnejše

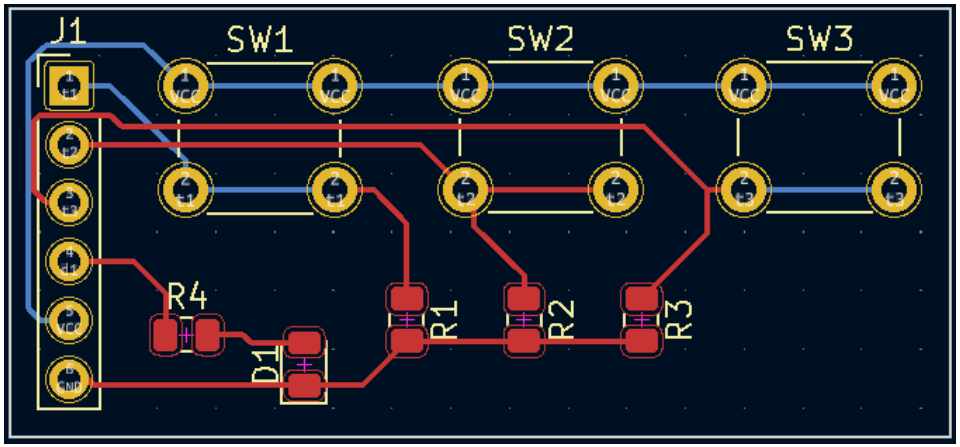
DRC za Lingva panele

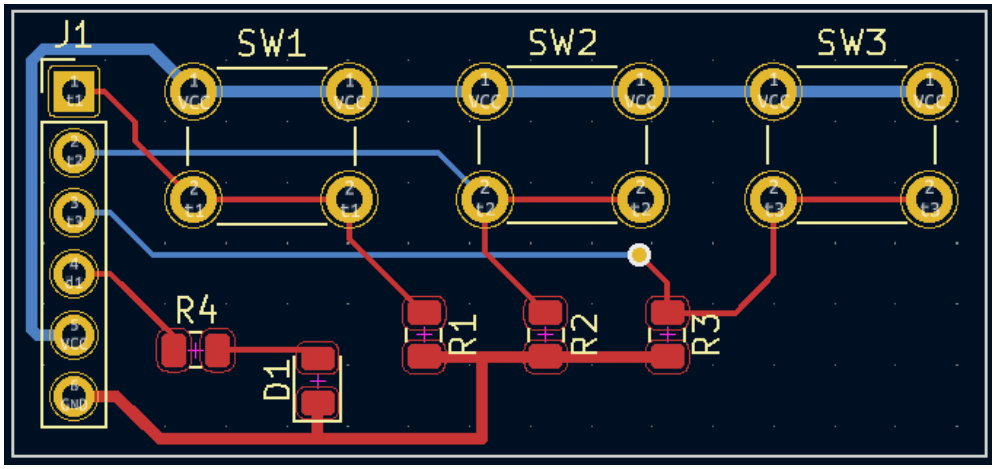
Min. debelina povezave: 8 mil
Min. odmik: 8 mil
Min. odmik od roba: 4 mil
Min. premer luknje: 0,3 mm
Min. premer pada/vie: 0,6 mm
Min. razmak med luknjami: 5 mil



3. povezovanje

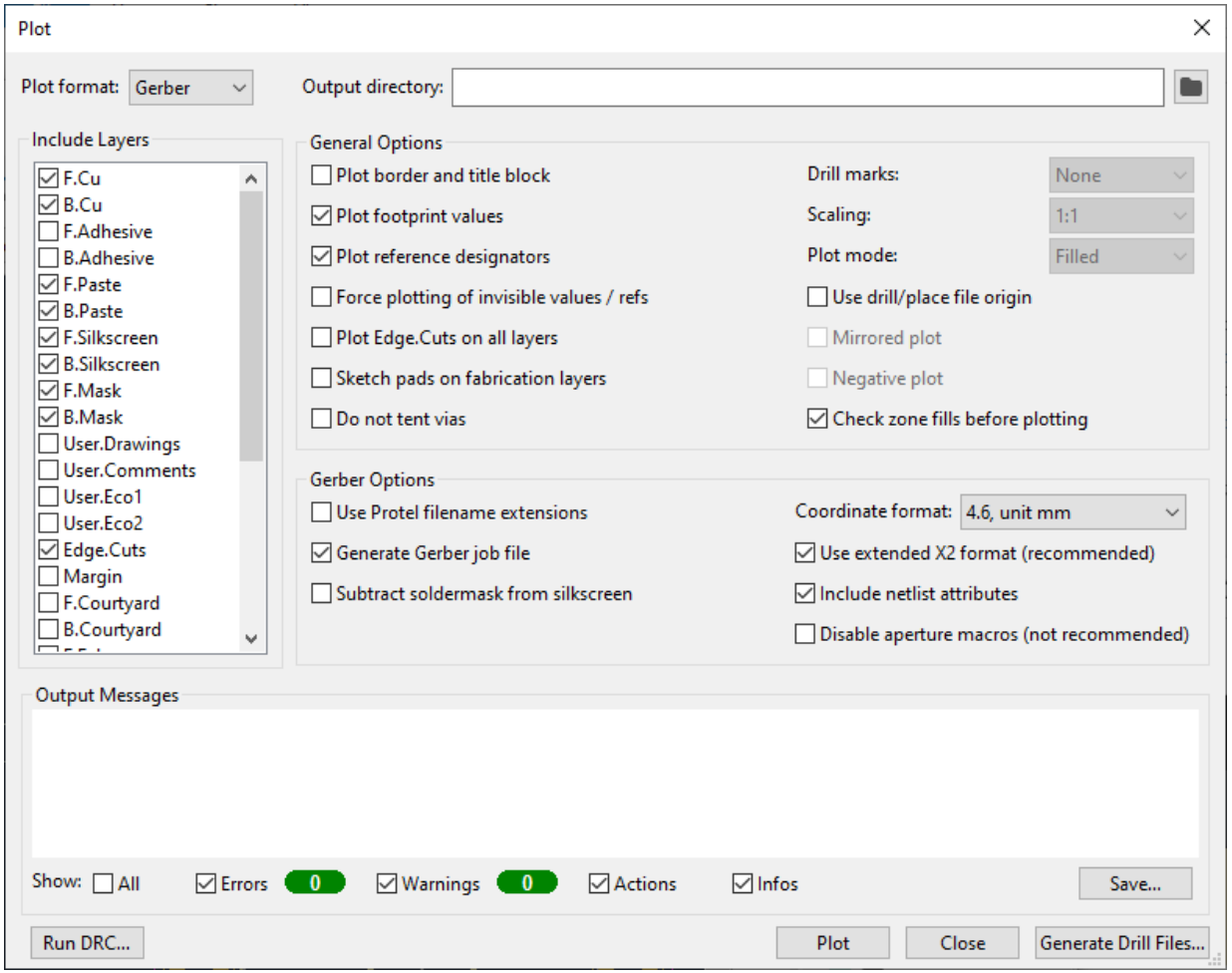
- avtomatsko ali ročno (**KiCAD**)
- strategija: na eni plasti povezave pretežno v eni smeri





4. izvoz proizvodnih datotek

- datoteke za posamezne plasti + izvrtine
- standarden format: gerber, drill

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; #@! TA.AperFunction,Plated,PTH,Comp
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%
G90
G05
T1
X8.17Y-4.5
X8.8066Y-4.25
T2
X7.1006Y-4.9
X7.2006Y-4.9
X7.3006Y-4.9
X7.4006Y-4.9
X7.5006Y-4.9
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