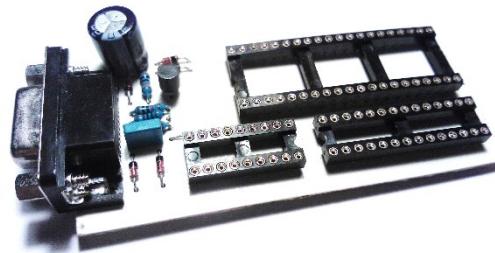


## Preprost PIC 16F88 USB programator

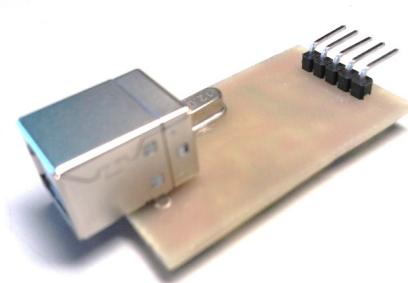
Z razvojem osebnih računalnikov so iz perifernih enot, predvsem prenosnih računalnikov, začenjali izginjati COM priključki. Če smo si še nekaj let nazaj lahko sami, enostavno in zelo poceni, izdelali preprost PIC programator s priklopom na serijska vrata, smo danes že primorani uporabiti USB povezavo. Tu nastopijo problemi. USB-COM pretvorniki s prilagajanjem napetostnih nivojev ali z manjšim posegom v naš programator sicer delujejo, a na tem mestu odpove obstoječa programska oprema, ki se ji na počasne USB paketke enostavno ne da čakati. Vsi strojni triki odpovejo, napaka je v programu. Zanimivo pri tem je, da se sekvenca vpisovanja podatkov v PIC izvaja pravilno, le ko podatke preverjamo naletimo na navidezne napake v spominu mikrokrmlilnika. Teh napak seveda v večini primerov ni, naš računalniški program se je naveličal čakanja na USB paketek in si tako napako 'izmisli'.

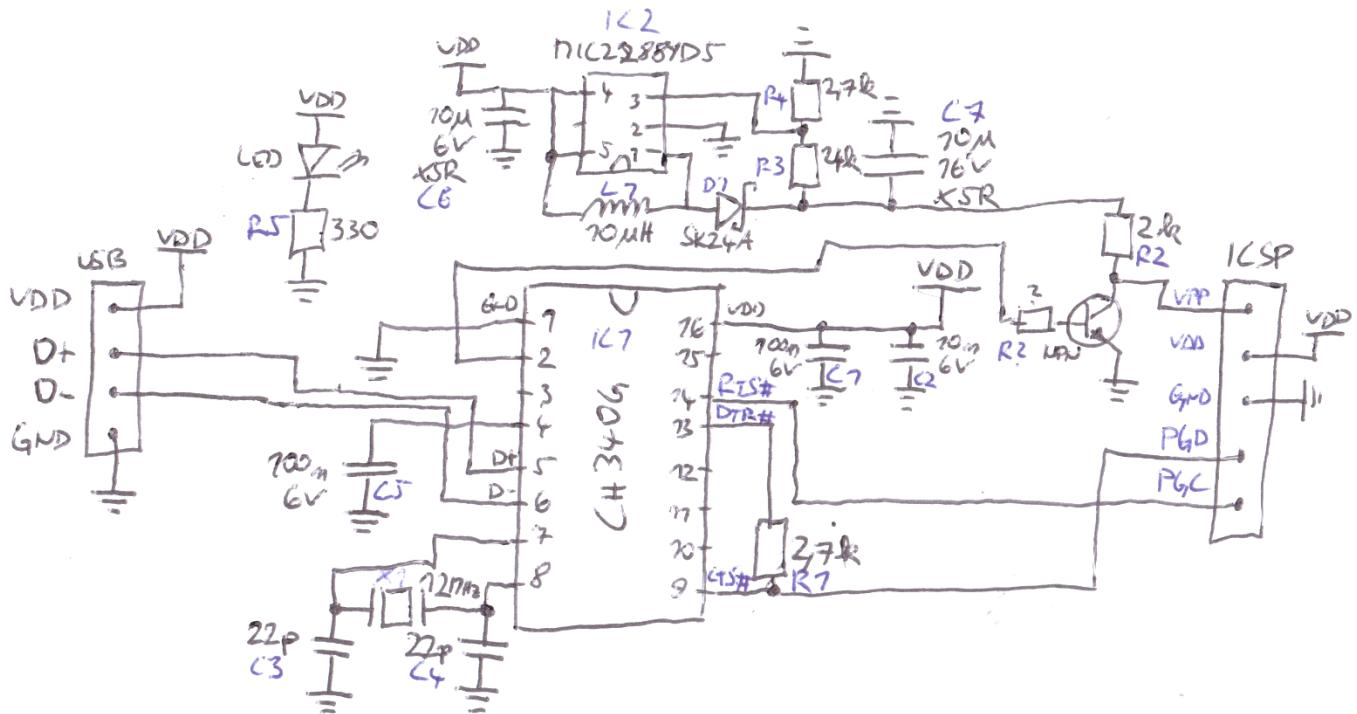


Rešitev problema je v nakupu ali izdelavi USB programatorja. Za domačo delavnico je v nastajanju tega članka s strani proizvajalca priporočen in podprt programator PICkit3. Za ročno izdelavo je njegovo vezje že zelo komplikirano, za kar bi potrebovali dvoslojno vezje s kar nekaj vijami. Sledi nakup že izdelanega programatorja. Tega (klon, ki deluje enako dobro) dobimo s Kitajske za dobrih 10€, lahko pa kupimo tudi originalnega, ki stane nekoliko več.

Če smo še vedno zagrizeni izdelovalci lastnih tiskanin, je najboljša izbira generacijo starejši, a še vedno uporaben in podprt programator PICkit2. Njegovo vezje je manj komplikirano in ga lahko izdelamo na enoslojni tiskanini. V svojem osrčju za komunikacijo z računalnikom in za programiranje našega čipa uporablja PIC18f2550. Nato se soočimo s problemom kokoš-jajce. V PIC18f2550, ki ga kupimo v trgovini, moramo nekako zapeči programsko kodo. Torej, gradimo programator, za katerega potrebujemo programator. Morda dodam samo, da bo strošek komponent večji, kot če bi naročili kopijo s Kitajske.

Če smo škrti do konca, lahko izdelamo tudi USB programator, ki je predstavljen v tem sestavku. Njegova arhitektura temelji na USB-COM vmesniku, napake pa so odpravljene z novo programsko opremo za osebni računalnik. Cena takšnega programatorja znaša dobra 2€, lahko pa uporabimo že kak obstoječ USB-COM vmesnik, ki ga prilagodimo našim potrebam. Vendar pozor! Programator je bil izdelan za potrebe učenja delovanja PIC mikrokrmlilnikov, njegov PC program pa podpira samo en PIC mikrokrmlilnik in sicer PIC16F88.



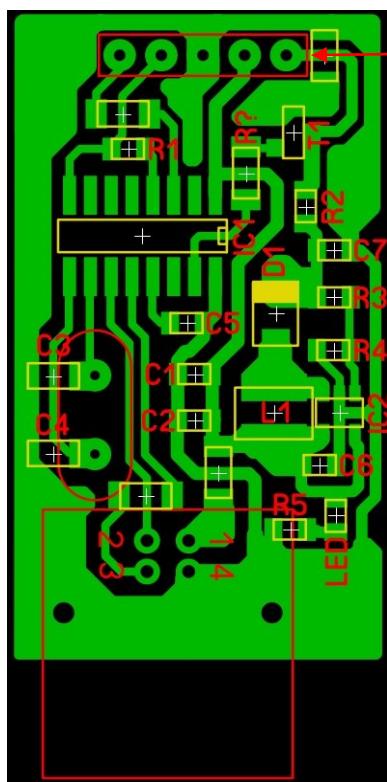


z Shema preprostega USB PIC programatorja

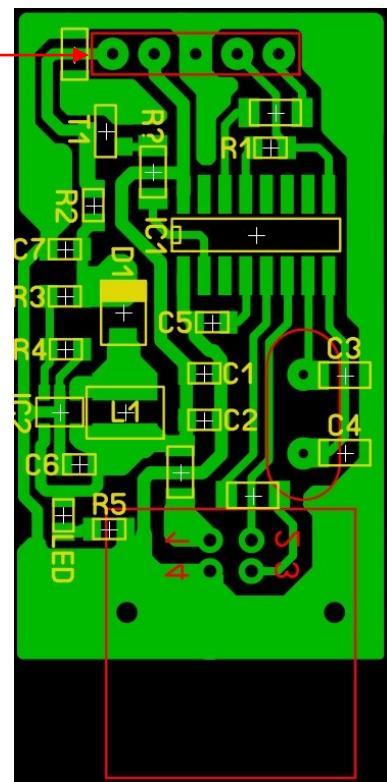
Kot glavni IC je uporabljen USB-Serial CH340G, ki je cenejši Kitajski nadomestek standardnega FTDI čipa. Na tem mestu lahko uporabimo poljuben USB-Serial vmesnik, le da ima ta na svojem izhodu tudi kontrolne linije, ter da njihovo uporabo podpira tudi gonilnik v PC-ju (prevzeti Windows gonilnik tega ne omogoča!). Za programiranje uporabljamo linije Tx, RTS#, DTR#, CTS# (# - izhodi so negirani). Upor R1 preprečuje kratek stik, ko PIC preklopi iz sprejemanja v oddajanje. Vse povezave so speljane na standardno 5-pinsko ICSP vtičnico (6.-pina za nizkonapetostni režim ne uporabljamo). Napetost za programiranje vklapljam z NPN tranzistorjem, generiramo pa jo s stikalnim regulatorjem. Napetost naj znaša približno 12V, lahko jo pripeljemo tudi od zunaj, vendar naj bo stabilna.

### Izdelava tiskanine

Tiskanino izdelamo na enostranskem laminatu FR4 debeline vsaj 1.2mm, da preprečimo lomljenje. Ploščica naj bo velika vsaj 2.4 x 4.2 cm. Debelina vseh lukenj je 0,8mm z izjemo lukenj konektorja USB, kjer uporabimo vsaj 1,8mm debel sveder. Najprej prispajkamo oba čipa, nato nadaljujemo s tuljavo in schottky diodo, ter preostalimi SMD elementi. Neoznačeni elementi velikosti 1206 so 0 Ohm upori, ki jih uporabimo kot mostičke. Upor R? je bazni upor, ki v našem primeru ni potreben, saj uporabljen tranzistor že vsebuje ustrezni bazni upor v svojem ohišju, tako na njegovo mesto ravno tako namestimo 0R 1206 mostič. Pri kondenzatorju C3 bodimo posebno previdni, saj pod njim poteka povezava, element velikosti 0805 pa spajkamo na podnožje velikosti 1206. Pri LED diodi pazimo na polariteto. Nato prispajkamo kristal ter zatično letev, na koncu še USB konektor. Razporeditev elementov ter njihov seznam, je priložen na naslednjem listu.



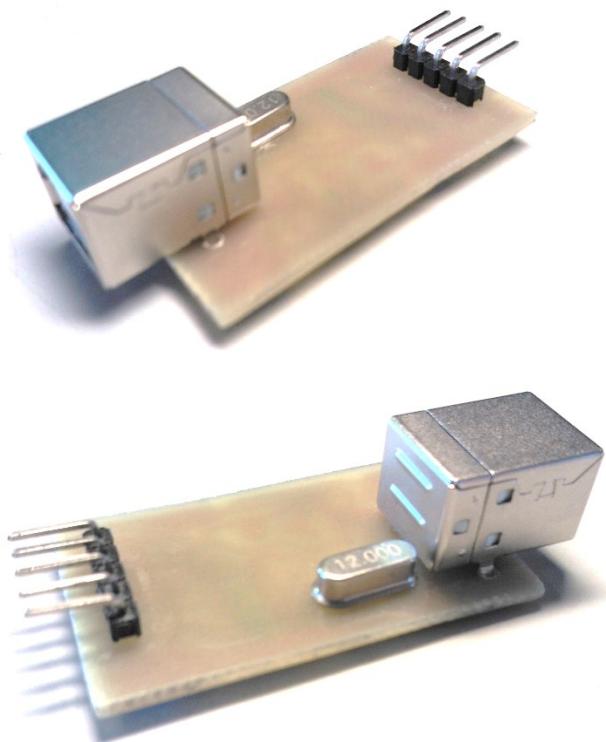
4 Pogled na tiskanino od ZGORAJ

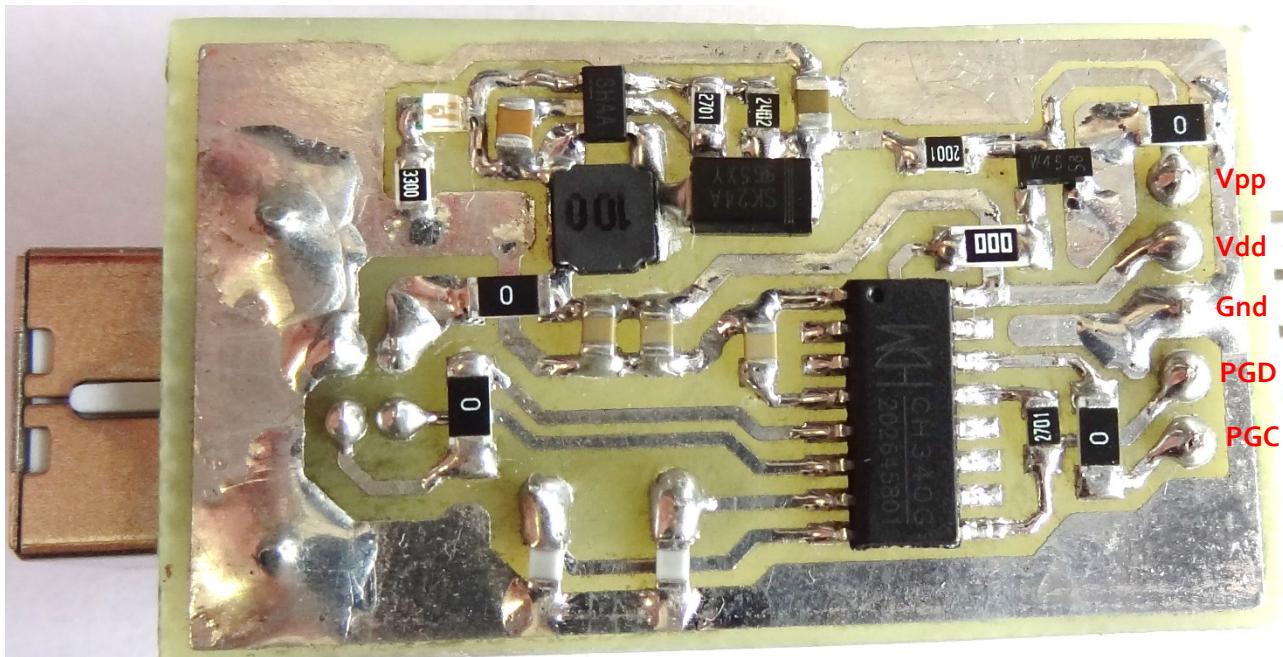


3 Pogled na tiskanino od SPODAJ

ID	Vrednost	Ohišje	Komentar
C1	100n	0805	
C2	10n	0805	
C3	22p	0805	
C4	22p	0805	
C5	100n	0805	
C6	10u 16V X5R	0805	
C7	10u 16V X5R	0805	
D1	SK24A	SMA	
IC1	CH340G	SOIC 16	
IC2	MIC2288YD5	SOT 23-5	
L1	10uH	4012	TYS4012100M
LED	zelena	0805	
R1	2.7k	0805	
R2	2k (2,2k)	0805	
R3	24k	0805	
R4	2.7k	0805	
R5	220R	0805	
R?	R?	1206	0 Ohm pri PDTC124tt
T1	PDTC124TT	SOT 23	

\* neoznačeni 1206 elementi so 0 Ohm mostički



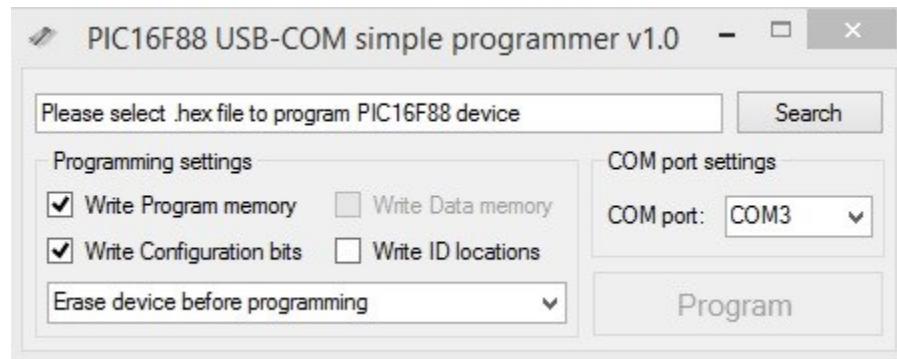


Naš mikrokrnilnik lahko preko vtičnice ICSP programiramo tudi v vezju. Tedaj pazimo le, da za naš programator na nogici PGD ne uporabljamo bremen, ki bi vplivale na branje podatkov iz PIC-a (torej brez pull-up, pull-down uporov, brez visokosvetlečih LED diod...). Nogica PGC je s tega vidika manj problematična.

### Programska oprema

Trenutna različica programske opreme podpira samo okolje Windows. Gonilniki za čip CH340g se naložijo samodejno, če uporabljamo Windows različice 8.0 +, drugače ga namestimo ročno. Program za delovanje potrebuje okolje .NET 3.5, ki je na operacijskem sistemu nameščen samodejno če uporabljamo Windows 7 ali več, na sistemu Windows XP in Vista pa le, če imamo omogočene posodobitve sistema. Drugače ga namestimo ročno z uradne spletnne strani podjetja Microsoft.

\*Program trenutno omogoča programiranje samo PIC16F88 čipa.



## DODATEK 1 - .gbr datoteka spodnjega sloja bakra:

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G71*	G54D12*	G54D20*	X552844Y495700D01*	D03*	X687249Y526365D02*
G01*	D03*	D03*	X558400Y512156D01*	X696116Y596903D02*	X6880a3*53432D01*
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%ADD11C, 1.60*%	G54D13*	X576656Y508400D02*	X554431Y510781D01*	D03*	G54D27*
%ADD12C, 4.00*%	D03*	X576656Y48875D01*	X542525Y510781D01*	X716716Y596903D02*	X68645Y526365D02*
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D03*	D03*	X616662Y788275D02*	X616662Y788275D02*	X652335Y577405D02*	X642114Y483072D01*
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G54D10*	G54D35*	D03*	X616662Y788275D02*	X652335Y577405D02*	X642114Y483072D01*
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G54D10*	G54D36*	D03*	X616662Y788275D02*	X652335Y577405D02*	X642114Y483072D01*
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G54D10*	G54D37*	D03*	X616662Y788275D02*	X652335Y577405D02*	X642114Y483072D01*
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X558006Y642150D02*	X616662Y788275D02*	G54D38*	X616662Y788275D02*	X652335Y577405D02*	X642114Y483072D01*
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X558006Y642150D02*	X616662Y788275D02*	G54D39*	X616662Y788275D02*	X652335Y577405D02*	X642114Y483072D01*
G54D10*	G54D39*	D03*	X616662Y788275D02*	X652335Y577405D02*	X642114Y483072D01*
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