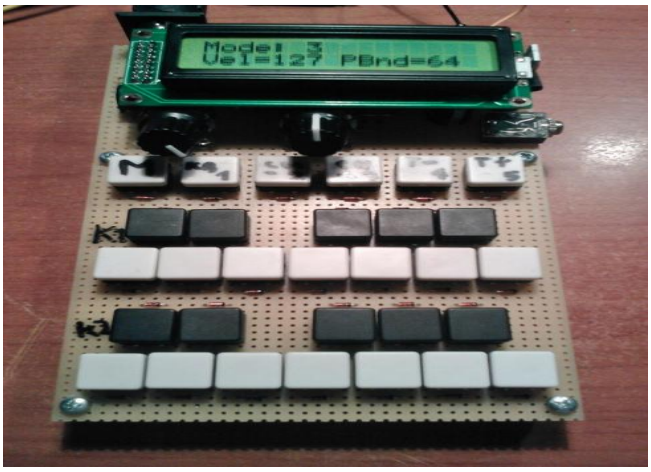
Miniature programable synthesizer

PART NO. 2188406



This is a miniature single board synthesizer whose propose is to test various MIDI equipment, and for playing simple tunes or drum kits.
It contains a PIC microcontroller that can be programed at any time(via serial programmer), so that it can be tweaked or customized for any specific propose. You can use a MIDI cable to connect it to a PC, and once connected use any software to read the MIDI port. Usually all music composing software should be able to read this device and receive incoming data.

Time Required: 4 hours depending on experience

Experience Level: Intermediate

Required tools and parts:

Soldering iron and Solder
PIC18F4520-I/P
20 White Caps for Switches
PIC programmer (a serial programmer would be a plus)
MIDI cable

Bill of Materials:

Qty	Jameco SKU	Component Name
10	1555389	Black Switch Caps
1	2118598	LCD module
1	786138	Linear 5V regulator
10	1537951	Diode
30	36038	Keypad diode
30	155380	Keyboard switch
2	158298	Capacitor
1	324268	Quartz crystal
10	15405	Capacitor
10	690700	220 Resistor
10	691104	10k Resistor
2	255549	Potentiometer
2	162481	Knob
1	29399	DIN 5 connector
1	2180535	Contrast trimmer
1	103393	Pin header
1	151555	Power connector
1	616690	Proto PCB
10	661677	Keyboard resistor
1	252808	12V Adapter
1	41136	40 Pin socket

Step 1 - Layout

If you are using a prototype PCB you will need to figure out a layout for the components.
Try arranging the components so that you get a nice layout that can be easily built and used.
Place the keyboard buttons on the lower side of the board, and the microcontroller, LCD, pots and connectors on the other side.
In order to save space you can place the LCD module above the microcontroller.

Step 2 - Solder components

Once you place the components on the board, flip the board over and solder them.
If the components are falling out in the process, you can bend a few pins a bit to prevent them from falling out while soldering. Also while soldering an individual component hold it with the other hand on the other side of the board so that it gets nicely aligned. If you don't, you might end up with badly aligned components on the board, which doesn't look very good.

Step 3 - Solder connecting wires

If using a prototype board, you will need to hand solder all of the connecting wires.
Use the schematic to figure out how to solder the wires.

(The schematics can be found at the end of this document)

Step 4 - Test the power supply

Before inserting the MCU(chip), power up the board and check if you get 5V at the power pins. If you have a higher voltage, you need to find the issue and fix it.
If the MCU is powered with more than 5V it will be permanently damaged.

Step 5 - Insert MCU

Bend the chip pins slightly inwards and insert the MCU(chip) into the socket. Pay attention not to insert it backwards, there is a dot and a notch on the socket and they must be on the same side.

Step 6 - Test device

Power up the device, and you should get something on the LCD screen. If nothing appears,try adjusting the contrast trimmer. If still nothing appears, then you have a fault with either the MCU or with the LCD module.
If it is working, plug the MIDI cable to the PC and start any software that can read from the MIDI port. Once you've started and configured the software, press a key on the piano keyboard, and your PC software should respond to it.

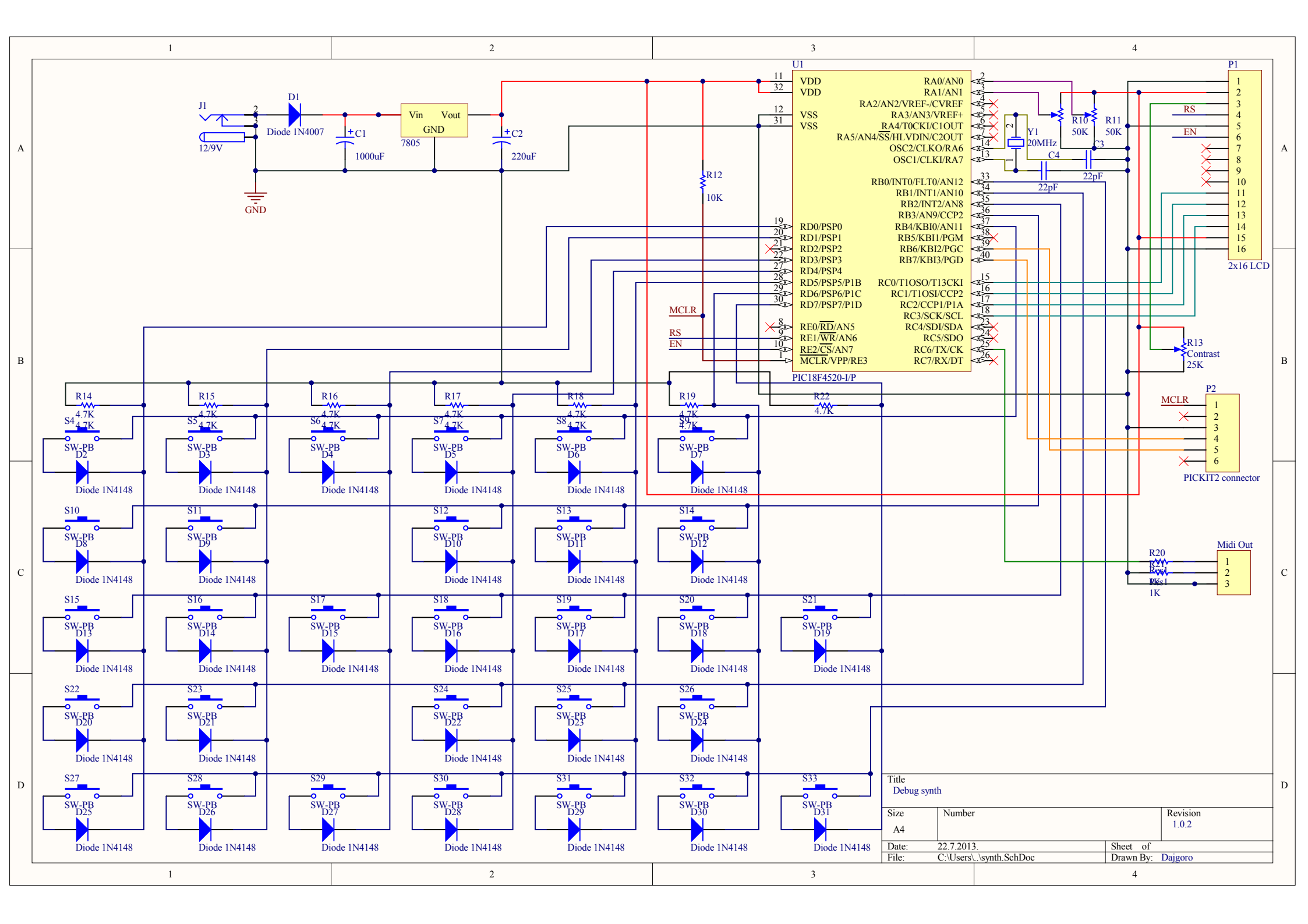
Step 7 - Chassis

If you have some materials, you can try building a small chassis for the device. You can leave it naked, but that might result in damaged components, or some of the wires might get shorted or disconnected.

Step 8 - Tweak

Use Proton IDE software to tweak the existing code or any other tools to write new code, and use a serial programmer (Pickit 2) to write new software to the MCU.

Have fun!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RA0/AN0
RA1/AN1
RA2/AN2/VREF-/CVREF
RA3/AN3/VREF+
RA4/T0CKI/C1OUT
RA5/AN4/SS/HLVDIN/C2OUT
OSC2/CLKO/RA6
OSC1/CLKI/RA7
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RD2/PSP2
RD3/PSP3
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RC6/TX/CK
RC7/RX/DT
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Y1
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22pF
C4
22pF
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50K
R11
50K
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R13
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25K
P2
MCLR
PICKIT2 connector
R22
4.7K
R20
1K
Midi Out
R14
R15
R16
R17
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4.7K
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SW-PB
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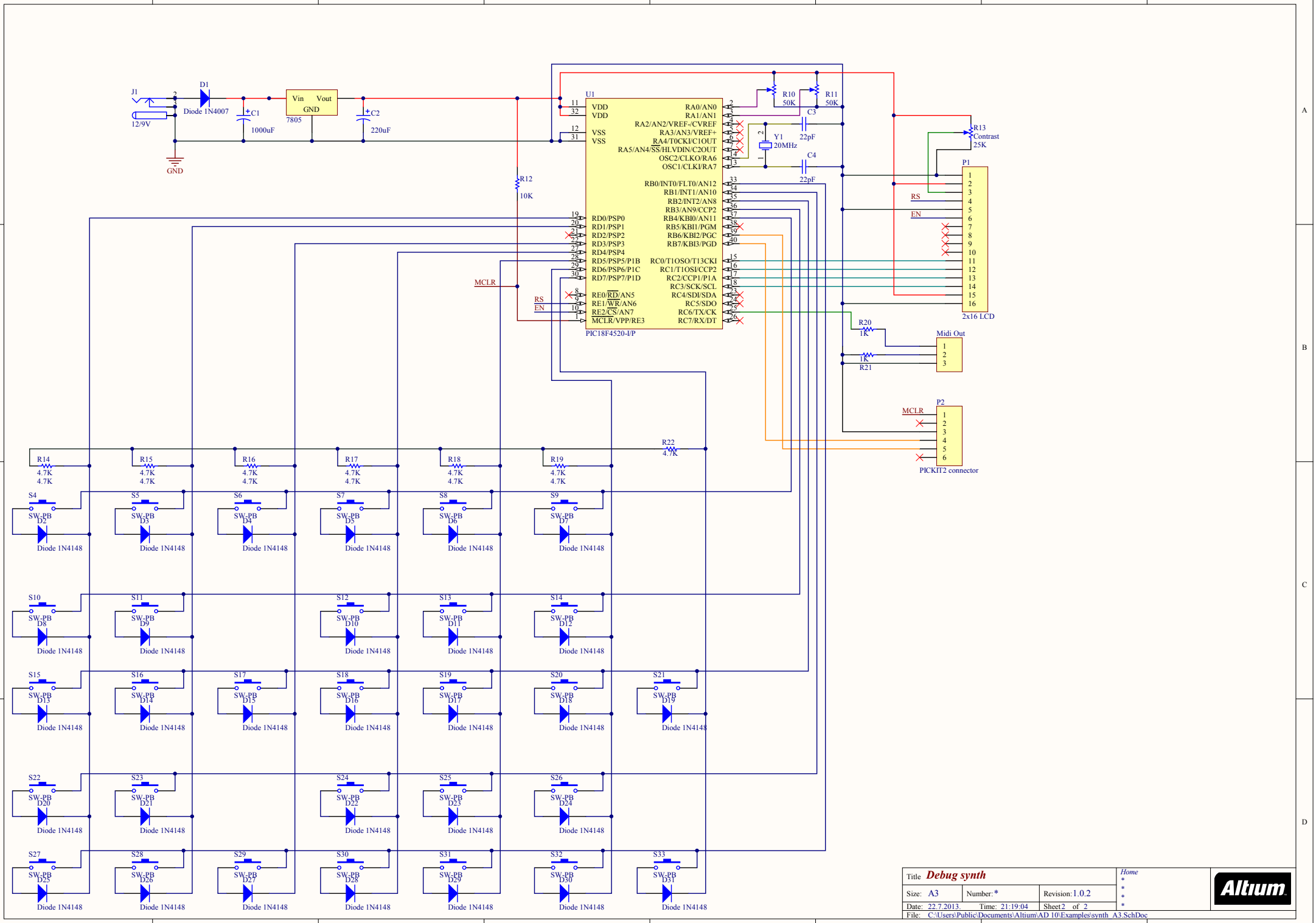
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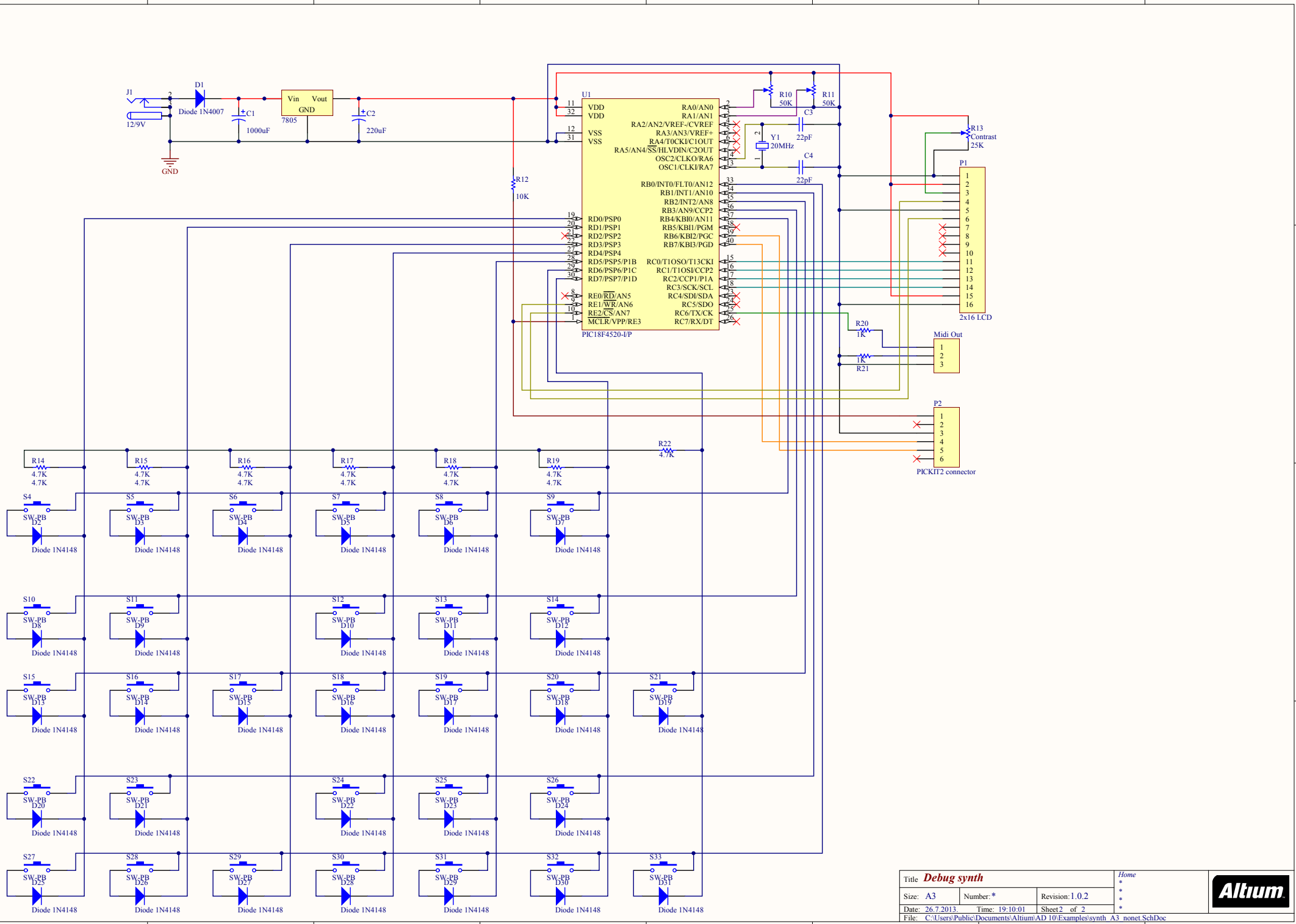
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