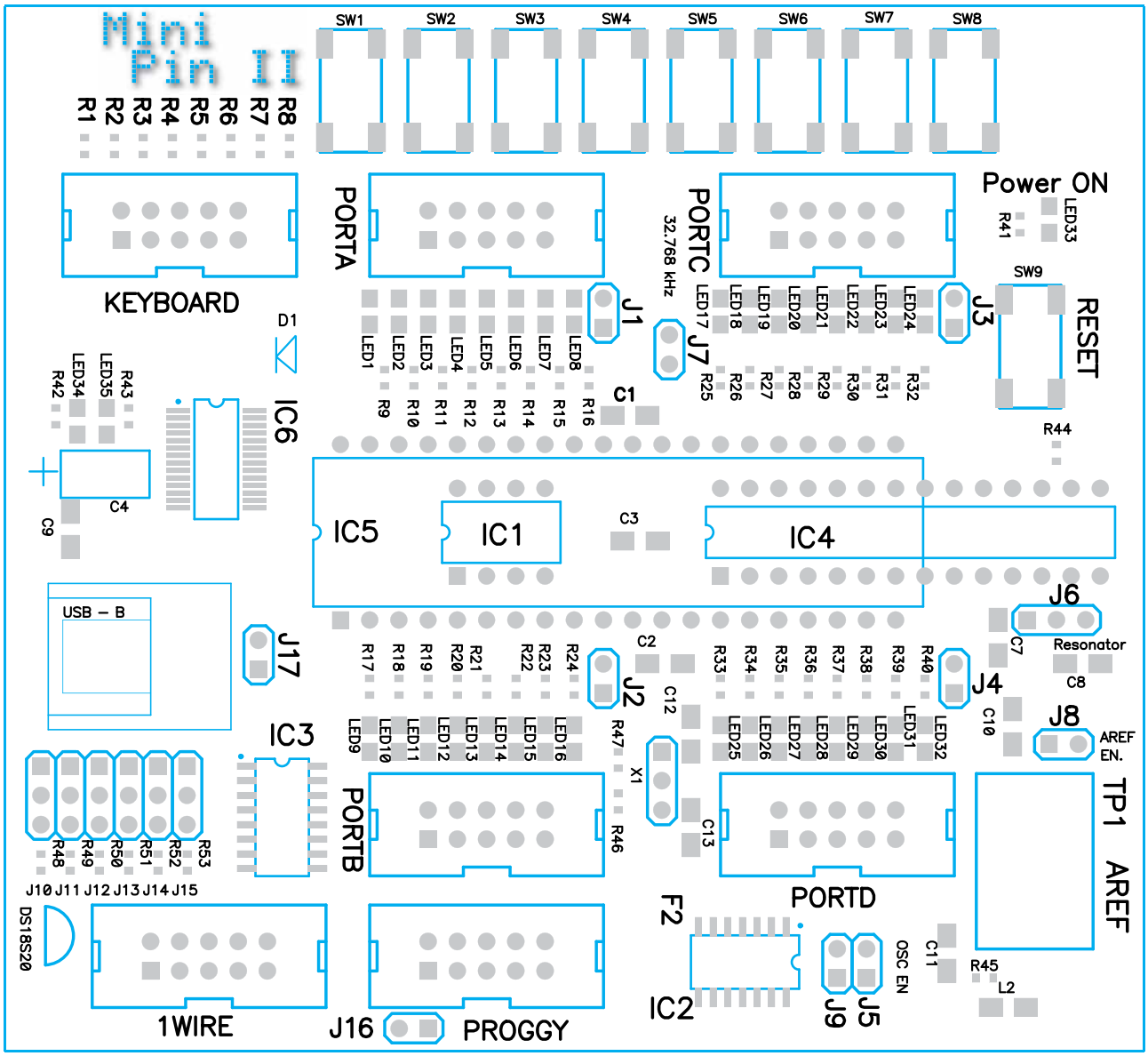
MiniPin II development board

By Jurij Mikeln

MiniPin II is a smaller brother of MegaPin. Smaller, but still very user friendly and versatile development board, where programs for AVRs may be tested and evaluated.

Key MiniPin II features:

1. supports all AVR microcontrollers in 8-pin, 28-pin & 40 pin DIL packages (except ATmega8515, 8535, i.e. older AVRs),
2. 6 built-in sockets for 1-Wire DS18S20 temperature sensors, which can be connected to any I/O Port,
3. 8 LEDs on each of four I/O ports (PortA, PortB, PortC & PortD),
4. IDC I/O connectors on four ports: (PortA, PortB, PortC, PortD),
5. built-in 250 mA fuse to protect USB from short circuit on board,
6. built-in USB communication to UART (not on MiniPin II B version!),
7. built-in external oscillator circuit to clock microcontroller from an external quartz crystal,
8. built-in 3-pin socket for ceramic resonator,
9. built-in 2-pin socket for 32,768 kHz quartz crystal,
10. built-in adjustable reference voltage for the AVRs ADC,
11. built-in keyswitch array which can be connected to any I/O Port,
12. built-in Power-ON LED,
13. built-in serial communication Tx/Rx LEDs.



Connecting your programmer to the MiniPin II board.

When connecting your programmer to the MiniPin II board, be sure that you connect the programmer's socket to the socket labelled "PROGGY", as shown in Figure1. If you don't own a Proggy programmer, make sure that you connect it's signals to the MiniPin II board, as follows:

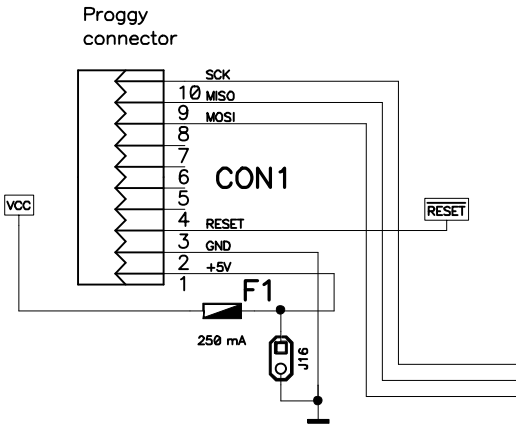


Figure 1: SPI Signals on Proggy IDC connector

The MiniPin II board is powered by the programmer and it has a 250 mA fuse in series with the Vcc power line, to protect your PC's USB port in case you have a short-circuit on your MiniPin II extension board.

Programming AVRs in MiniPin II

MiniPin II can program AVR microcontrollers that are mounted on the MiniPin II board itself - just mount your AVR chip in the appropriate socket, connect your programmer to MiniPin II and your AVR chip is ready for programming.

ISP programming from within AVR Studio 4

Mount your AVR microcontroller in the appropriate socket and click the AVR icon from within the AVR Studio 4 program (Figure2).

Using the **Main** tab, select the microcontroller that you want to program (Figure 3).

Figure 2: Connect to Programmer icon

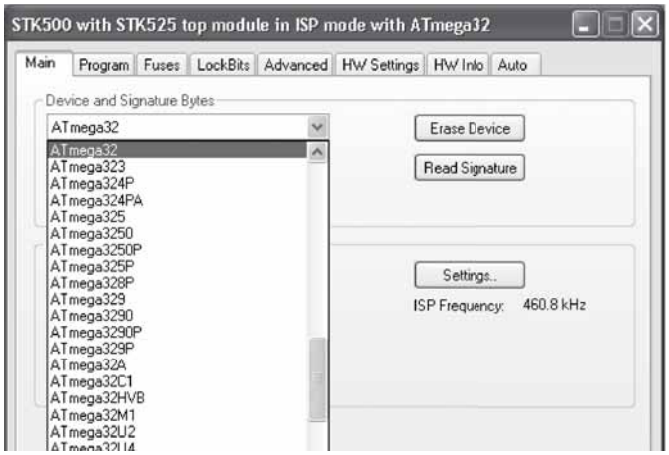


Figure 3: Select microcontroller

To insure that communication is OK, and that you have selected the correct microcontroller, press the **Read Signature button.** If the read signature corresponds to the microcontroller you are programming, then you may proceed with programming. If the signature doesn't match, then select the correct microcontroller from the list. If the program can't even read the microcontroller's signature, then there is something wrong with either the microcontroller, or some connections on the MiniPin II board are wrong (i.e. remove load from PortB).

ISP programming from within Bascom-AVR

Mount your AVR microcontroller in an appropriate socket, and within Bascom-AVR select **Options/Programmer**. A window like that shown in Figure 4 will pop-up.

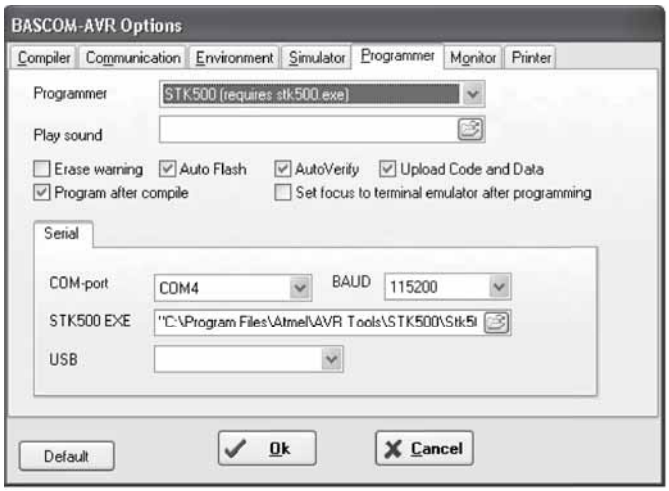


Figure 4: Bascom programming setting

In the **Programmer** window, select STK500 (requires stk500.exe), and set **COM-port** to the same COM port number as seen in the Device Manager program (see the full description regarding this subject in the MegaPin chapter). Then double-click the **folder** icon (to the right of the STK500 EXE window) and select the path to your STK500.exe file (which is usually the same as that shown

in Figure 4). Set the Baud rate to 57,600. Click OK and your Bascom-AVR settings are all done.

ISP programming in Bascom-AVR – the STK500 Native driver

Figure 5 shows the proper settings for programming using the **STK500 native driver**.

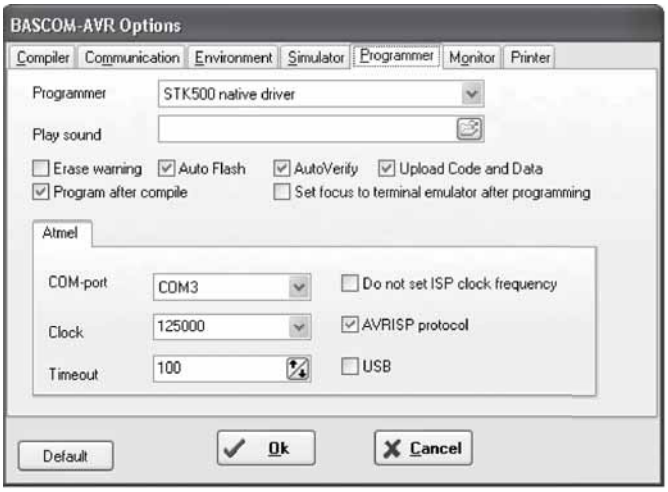


Figure 5: STK500 native programmer settings

1-Wire® sensors

The MiniPin II board has circuitry built-in to allow the use of popular DS18S20 temperature sensors. Please note that three sensors (J10-J12) are individually connected to their own I/O pin while those connected to J13 – J15 share the same I/O pin. For easier programming, sockets are labelled as follows: J10 connects to PortX.0, J 11 connects to PortX.1 etc. All data lines are pulled up to Vcc by 4k7 resistors. Connect CON5 to any I/O port (PortA, PortB, PortC, PortD) with a flat cable and you can now measure temperature with your sensor(s). For a Bascom sample program, please refer to "Bascom-AVR sample programs for use with MiniPin II" at the end of this chapter.

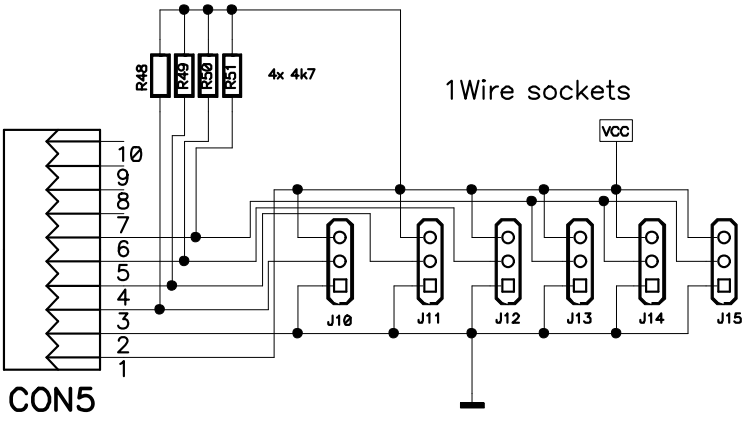


Figure 6: 1-Wire connections

Keyboard

The MiniPin II board has 8 keyswitches built-in, with protection resistors and a connector which allows the user to connect the keyswitches to any free I/O Port connector on MiniPin II.

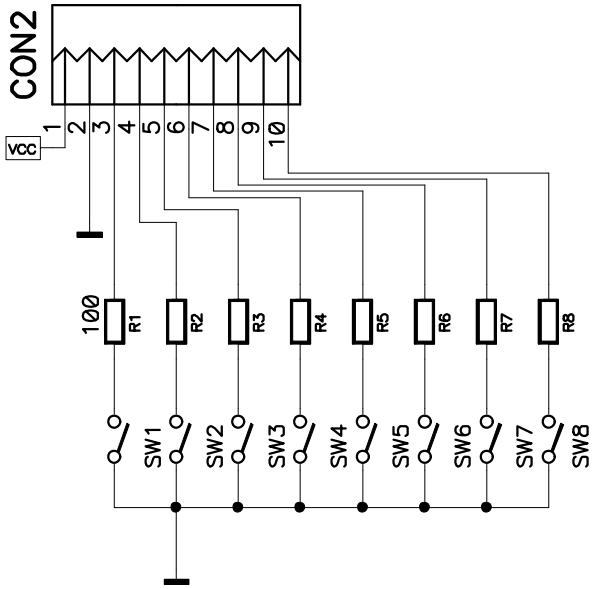


Figure 7

To use the keyswitches, connect CON2 to any I/O port (PortA, PortB, PortC, PortD) with a flat cable.

External Crystal oscillator

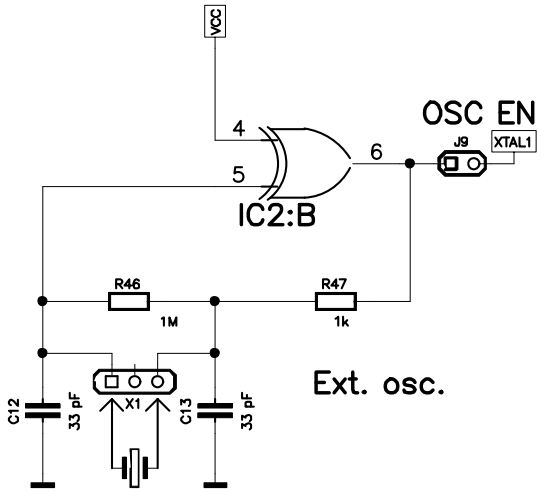


Figure 8

MiniPin II has a built-in External oscillator, where you can mount any crystal from below 1 MHz to up to 16 MHz. The External oscillator can be enabled with jumper J9. When using it with 8-pin AVRs you must also place a jumper at J5.

The external oscillator is very handy to have "on-board" when a microcontroller has its fuse bits

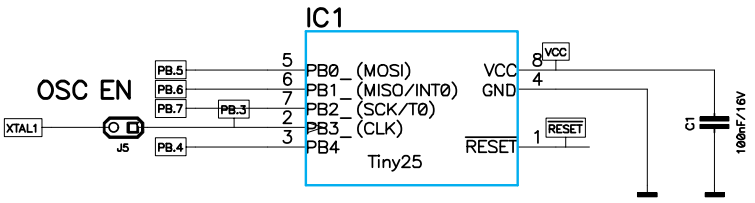


Figure 9

set (usually) accidently to External Oscillator. With the external oscillator enabled (and a crystal placed in socket X2) we can restore a wrongly-programmed AVR.

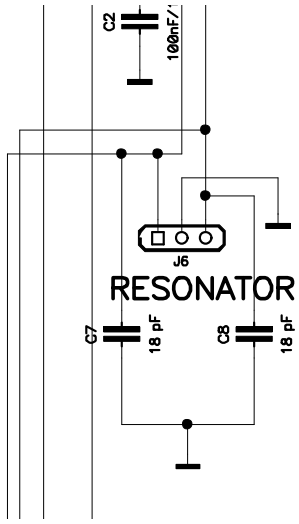


Figure 10

Use of a resonator or Quartz crystal

The MiniPin II board can also use a resonator or XTAL, if it is placed in socket J6. The capacitors needed for use with the crystal are pre-placed on the PCB.

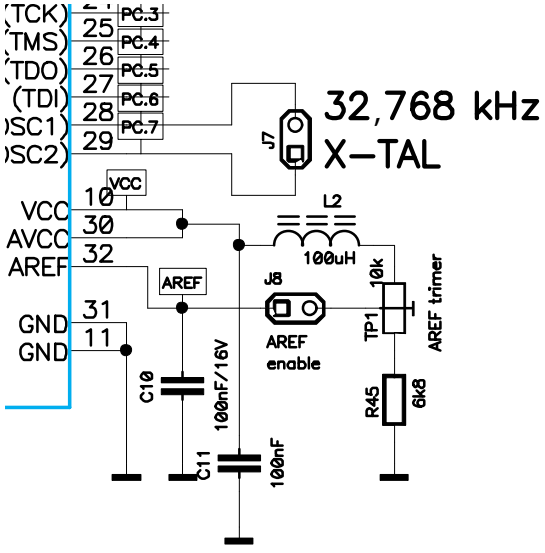
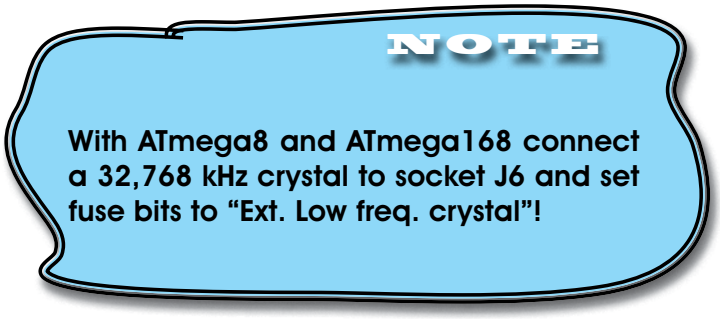


Figure 11

AREF and 32,768 kHz XTAL

The MiniPin II board has a built-in external reference voltage, which can be enabled with jumper J8 (AREF Enable). With the TP1 trimpot, the user can set AREF from nearly 5V down to 2.5 Volts. An external AREF is handy when performing analog to digital conversion (A/D) on voltages between 2.5 and 5.0 Volts. Most AVRs have both a built in Vcc (generally 5.0V) and an accurate 2.5V reference voltage. Using the Vcc reference voltage (generally 5.0V), the resolution of the 10-bit A/D conversion is 4.88 milivolts. If we perform A/D conversions of input voltages in the 3.0 V full-scale range, and we are looking for the best resolution, we would quickly see that a 5V reference is not suitable. With a 3.0 V reference voltage, we can achieve a resolution of 2.93 milivolts, which is nearly twice as good as that with 5.0 V reference voltage.



A 32,768 kHz (watch) crystal is very handy with AVRs that have a Timer2 which can operate in asynchronous mode. With a little Bascom code and 32,768 kHz watch crystal (see RTC chapter), we can make a Real Time Clock with actual date & time and not using too many microcontroller resources. RTC (Real Time Clock) clock routines can also wake-up the AVR microcontroller while in the Powersave mode, thus conserving battery power.

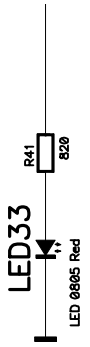


Figure 12

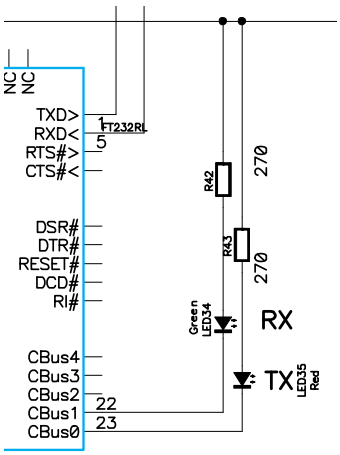


Figure 13

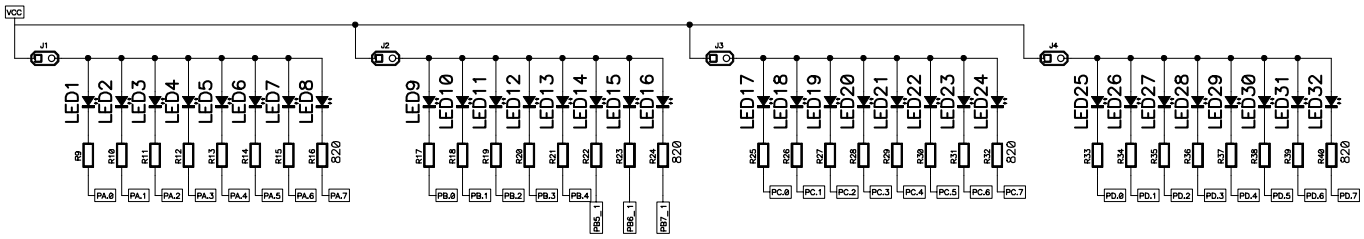


Figure 14

LED signalization

The MiniPin II board features many LEDs:

- Power supply OK,
- Rx/Tx communication,
- 8 LEDs on all four I/O Ports.

Communications

The MiniPin II board supports the following communications methods:

Serial bi-directional communications:

bi-directional communication between the target microcontroller and the USB port using an FT232RL USB bridge.

1-Wire

Place a DS18S20 in any of the sockets J10 to J15, connect CON5 with a flat cable to any Port connector (CON3, CON4, CON6, CON7). Socket J10 corresponds to PortX.0, J11 corresponds to PortX.1 etc. See the 1-Wire sensor section earlier in the chapter for more details.

Example program ID	
Name:	1Wire_1.BAS
Microcontroller:	Any AVR microcontroler
Testing circuit:	Figure 16
MiniPin compatibility:	yes
MegaPin compatibility:	yes
Single 1-Wire sensor on a bus, temperature is displayed on LCD	

Example program ID	
Name:	1Wire_2.BAS
Microcontroller:	Any AVR microcontroler
Testing circuit:	Figure 6
MiniPin compatibility:	yes
MegaPin compatibility:	yes
Program displays 1-Wire ID of two sensors on the bus	

Example program ID	
Name:	1Wire_3.BAS
Microcontroller:	Any AVR microcontroler
Testing circuit:	Figure 6
MiniPin compatibility:	yes
MegaPin compatibility:	yes
Same as 1Wire_2.BAS but ID of sensors are stored in EEPROM	

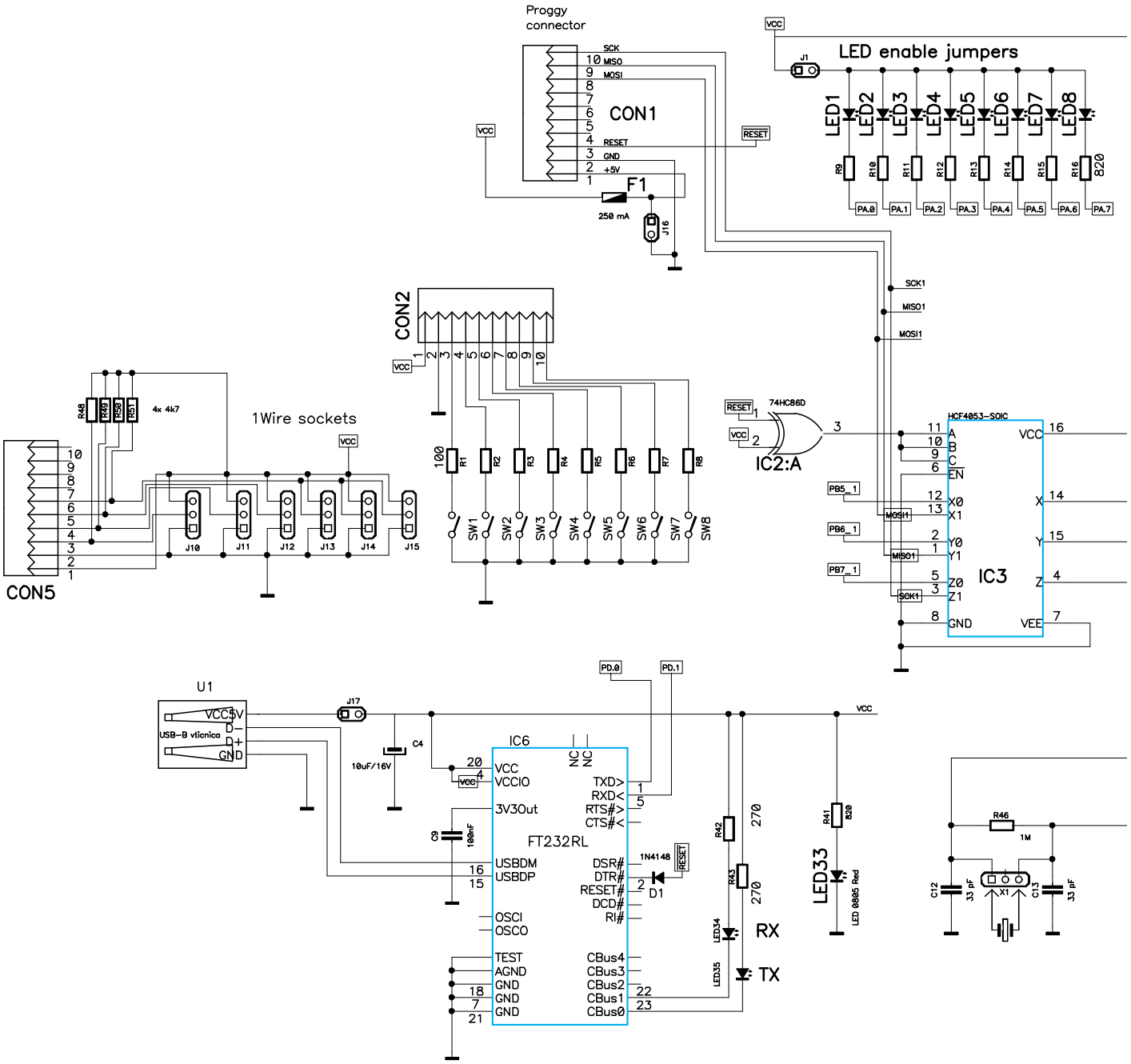
Example program ID	
Name:	1Wire_4.BAS
Microcontroller:	Any AVR microcontroler
Testing circuit:	Figure 6
MiniPin compatibility:	yes
MegaPin compatibility:	yes
Multiple 1-Wire sensors, one on each Port	

Example program ID	
Name:	For_loop.BAS
Microcontroller:	Any AVR microcontroler
Testing circuit:	/
MiniPin compatibility:	yes
MegaPin compatibility:	yes
Simple FOR-Next loop for testing LEDs on all ports	

Example program ID	
Name:	GLCD_1.BAS
Microcontroller:	ATmega AVRs
Testing circuit:	Figure 1, page 67 (GLCD chapter)
MiniPin compatibility:	yes
MegaPin compatibility:	yes
Use of graphical LCD with table drawn on LCD and 8x8 font	

Example program ID	
Name:	GLCD_2.BAS
Microcontroller:	ATmega AVRs
Testing circuit:	Figure 1, page 67 (GLCD chapter)
MiniPin compatibility:	yes
MegaPin compatibility:	yes
GLCD with fonts that can be placed anywhere on GLCD	

Example program ID	
Name:	GLCD_3.BAS
Microcontroller:	ATmega AVRs
Testing circuit:	Figure 1, page 67 (GLCD chapter)
MiniPin compatibility:	yes
MegaPin compatibility:	yes
GLCD with the use of a touch panel including simple calibration of the touch panel	


Proggy connector
CON1
SCK
MISO
MOSI
RESET
GND
+5V
F1
250 mA
J16
LED enable jumpers
J1
LED1
LED2
LED3
LED4
LED5
LED6
LED7
LED8
R9
R10
R11
R12
R13
R14
R15
R16
820
PA.0
PA.1
PA.2
PA.3
PA.4
PA.5
PA.6
PA.7
VCC
SCK1
MISO1
MOSI1
CON2
100
R1
R2
R3
R4
R5
R6
R7
R8
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
4x 4k7
R48
R49
R50
R51
1Wire sockets
J10
J11
J12
J13
J14
J15
CON5
74HC86D
IC2:A
HCF4053-SOIC
IC3
PB5_1
PB6_1
PB7_1
U1
USB-B vticnica
VCC5V
D-
D+
GND
J17
C4
10uF/16V
IC6
FT232RL
VCCIO
3V3Out
USBDM
USBDP
OSCI
OSCO
TEST
AGND
TXD>
RXD<
RTS#>
CTS#<
DSR#
DTR#
RESET#
DCD#
RI#
CBus4
CBus3
CBus2
CBus1
CBus0
C9
100nF
1N4148
D1
R42
R43
270
LED34
LED35
RX
TX
R41
820
LED33
LED 0805 Red
R46
1M
C12
33 pF
X1
C13
33 pF