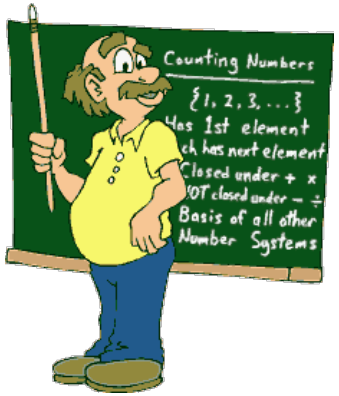
AARHUS
UNIVERSITY
SCHOOL OF ENGINEERING

MSYS

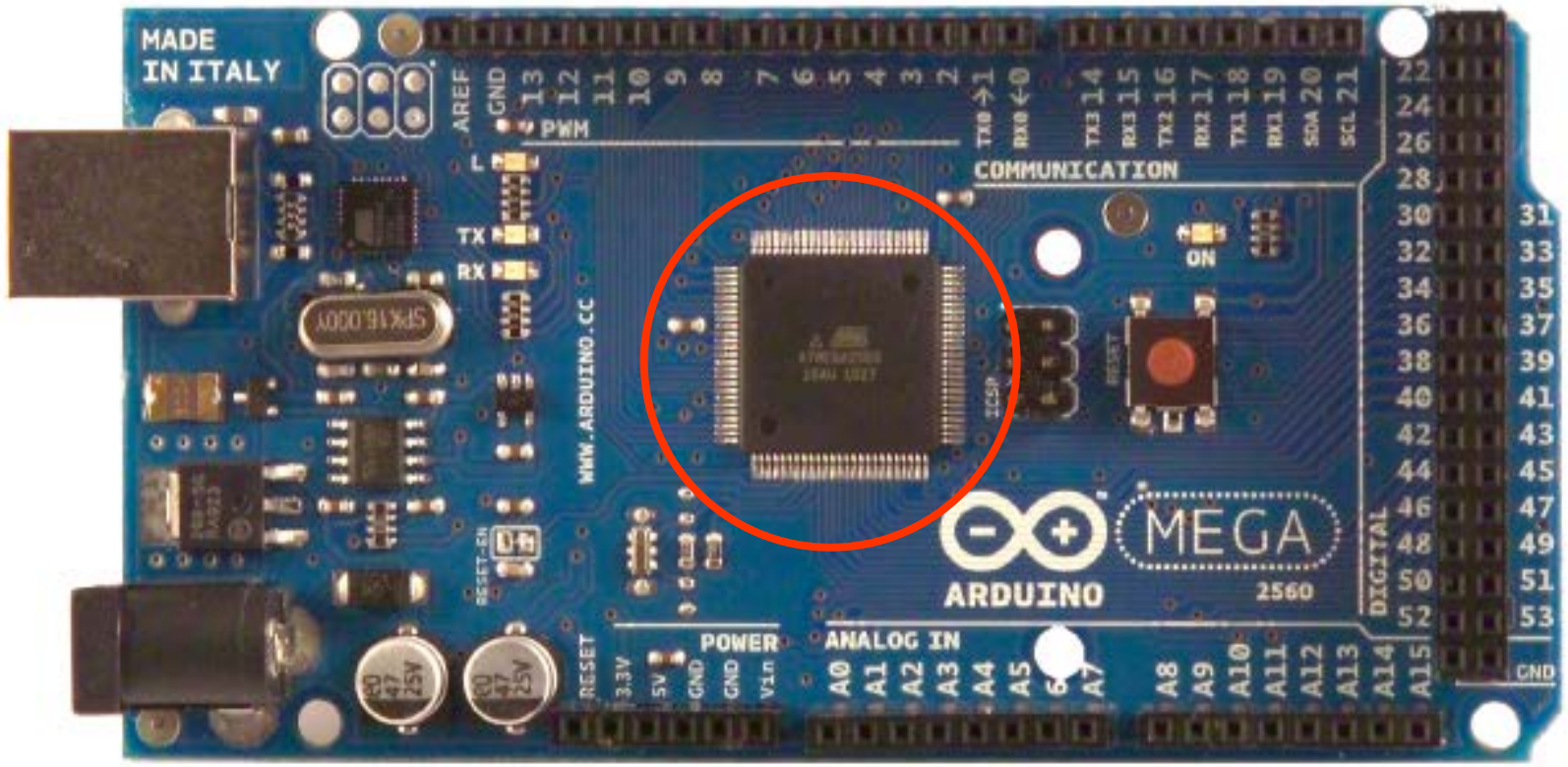
Microcontroller Systems

Lektion 3:
Arduino Mega2560 og Atmel Studio



Version: 4-9-2017, Henning Hargaard

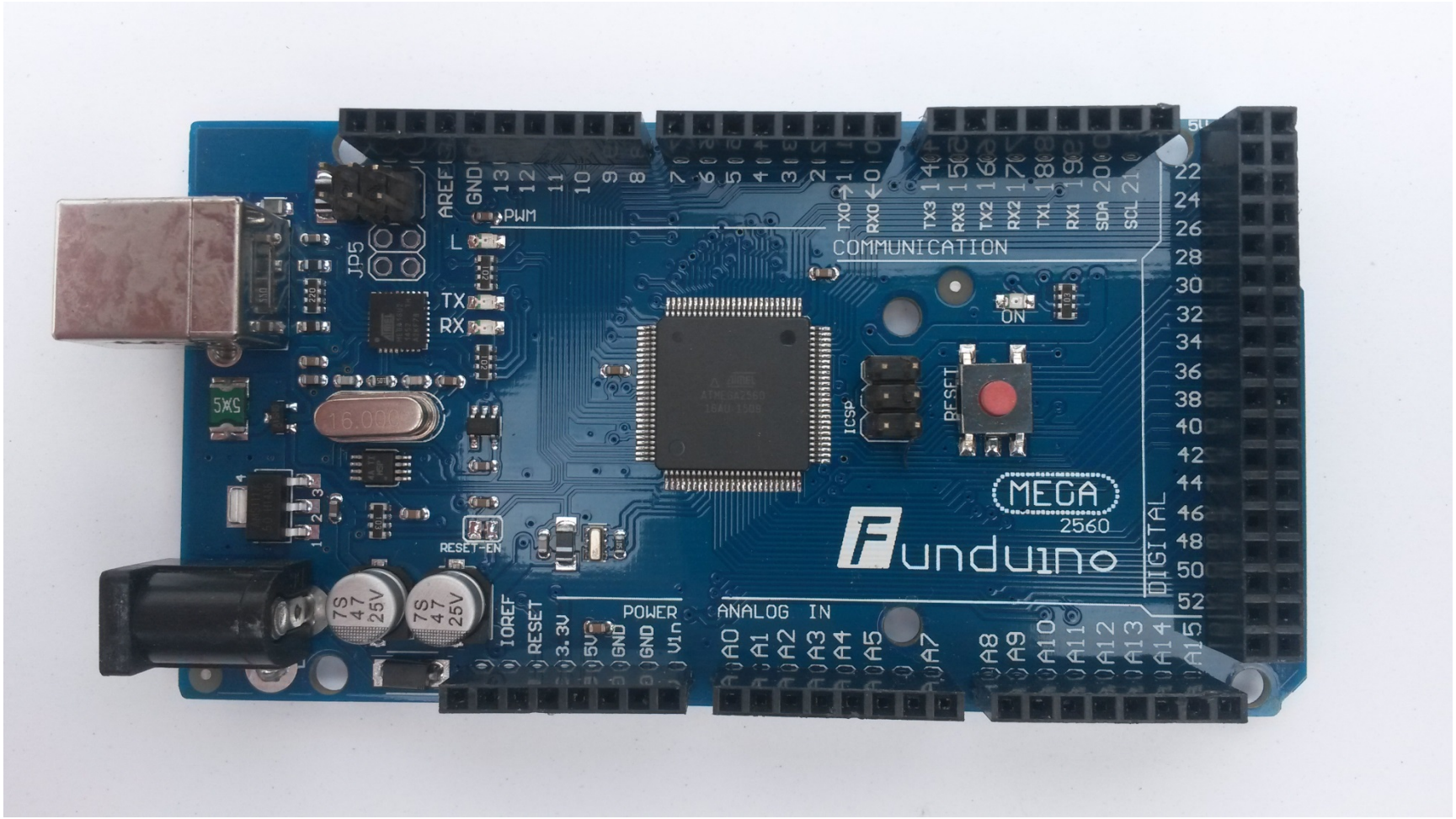
”Arduino Mega2560”



Husk at dette ikke må opfattes som ”vores computer”.

<u>Den monterede microcontroller</u> er ”vores computer”.

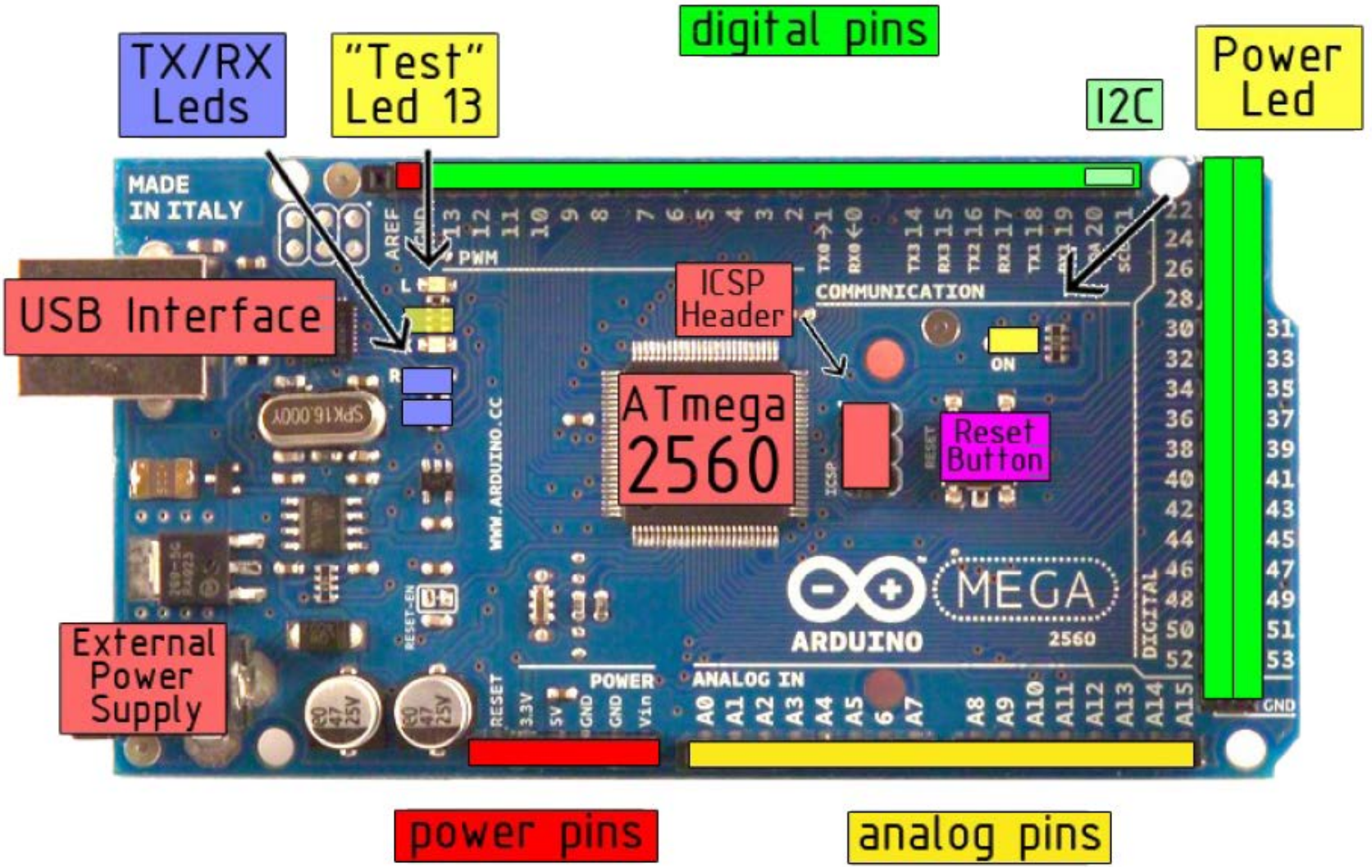
”Funduino Mega2560”



”Arduino Mega2560”

Microcontroller	ATmega2560
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	54 (of which 14 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	256 KB of which 8 KB used by bootloader
SRAM	8 KB
EEPROM	4 KB
Clock Speed	16 MHz

”Arduino Mega2560”



Pinouts er på MSYS Blackboard

Kursus-materiale

Mega32 / Mega2562

Arduino Mega2560 Board

Mega2560 I/O shield

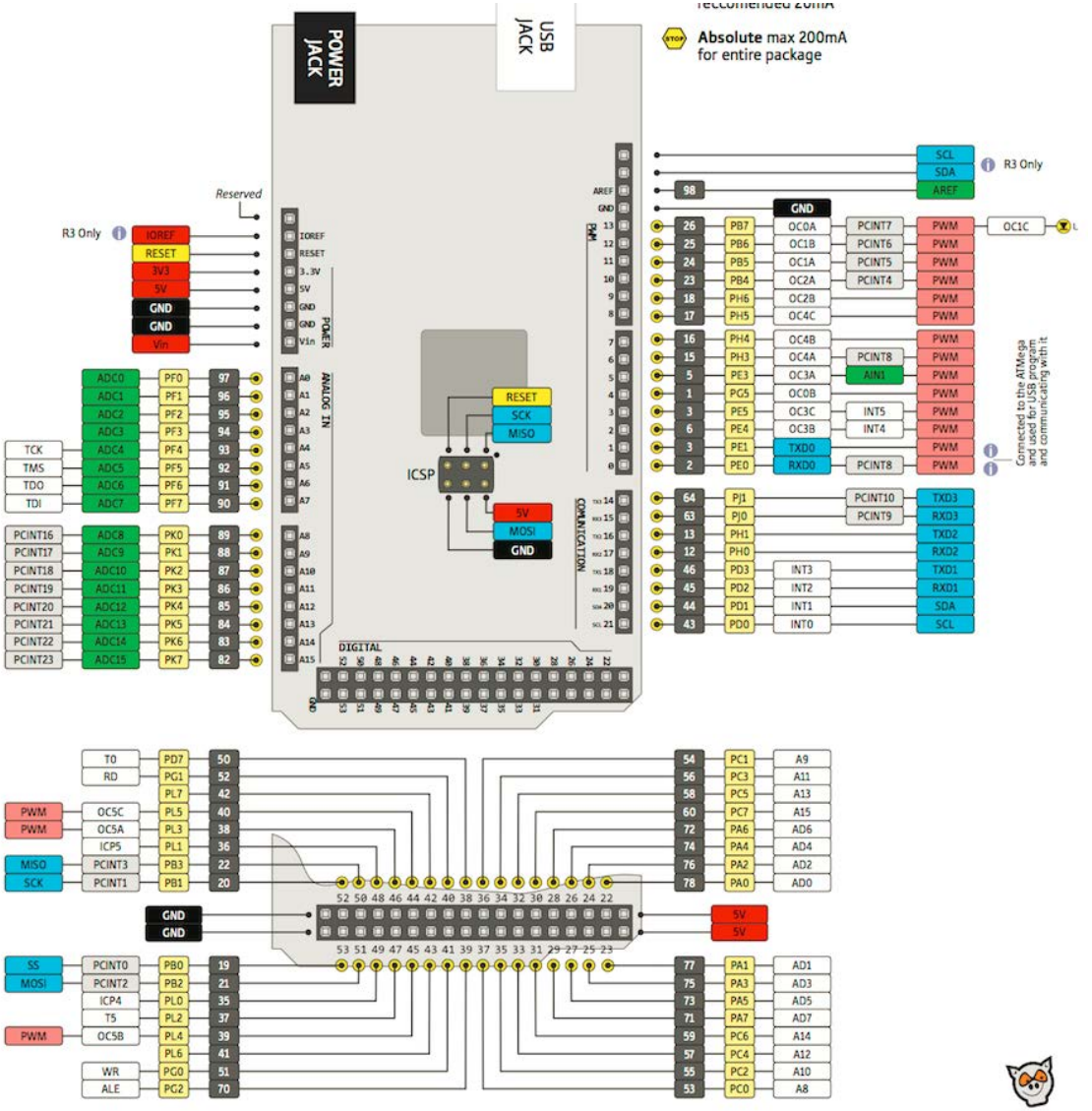
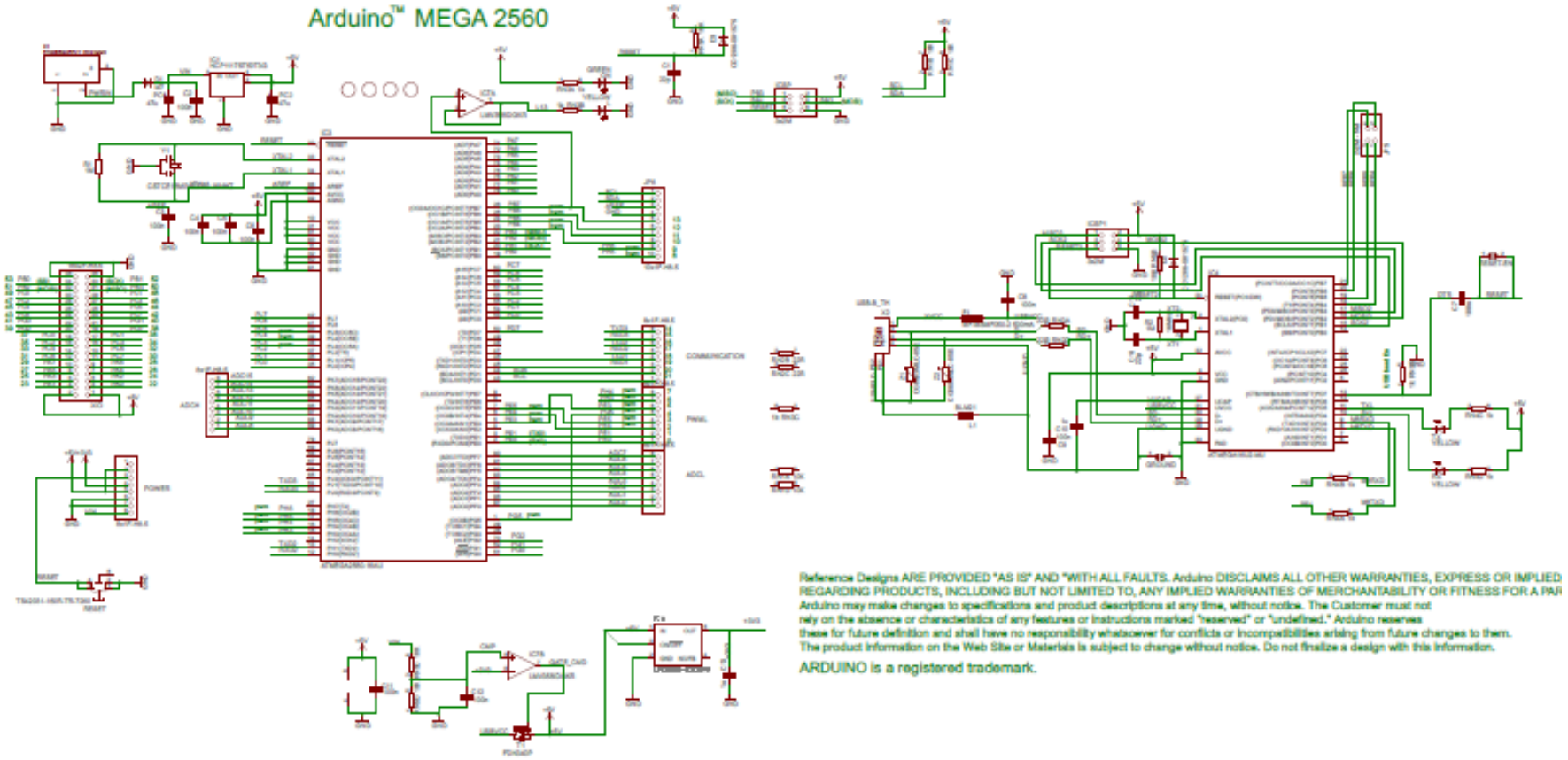


Diagram for ”Arduino Mega2560”



Findes på MSYS Blackboard

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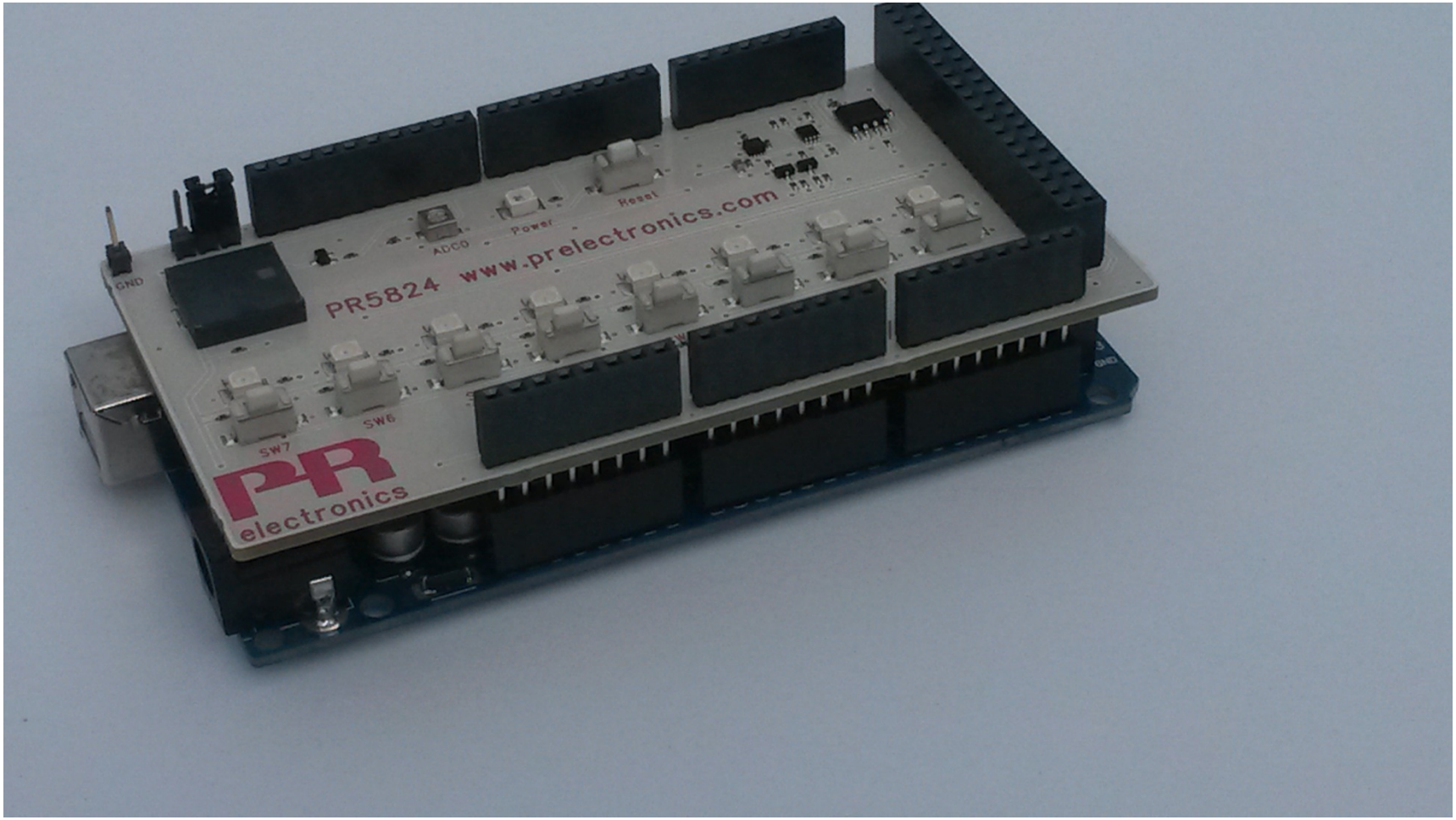
”Arduino Mega2560” + ”Mega2560 I/0 Shield”



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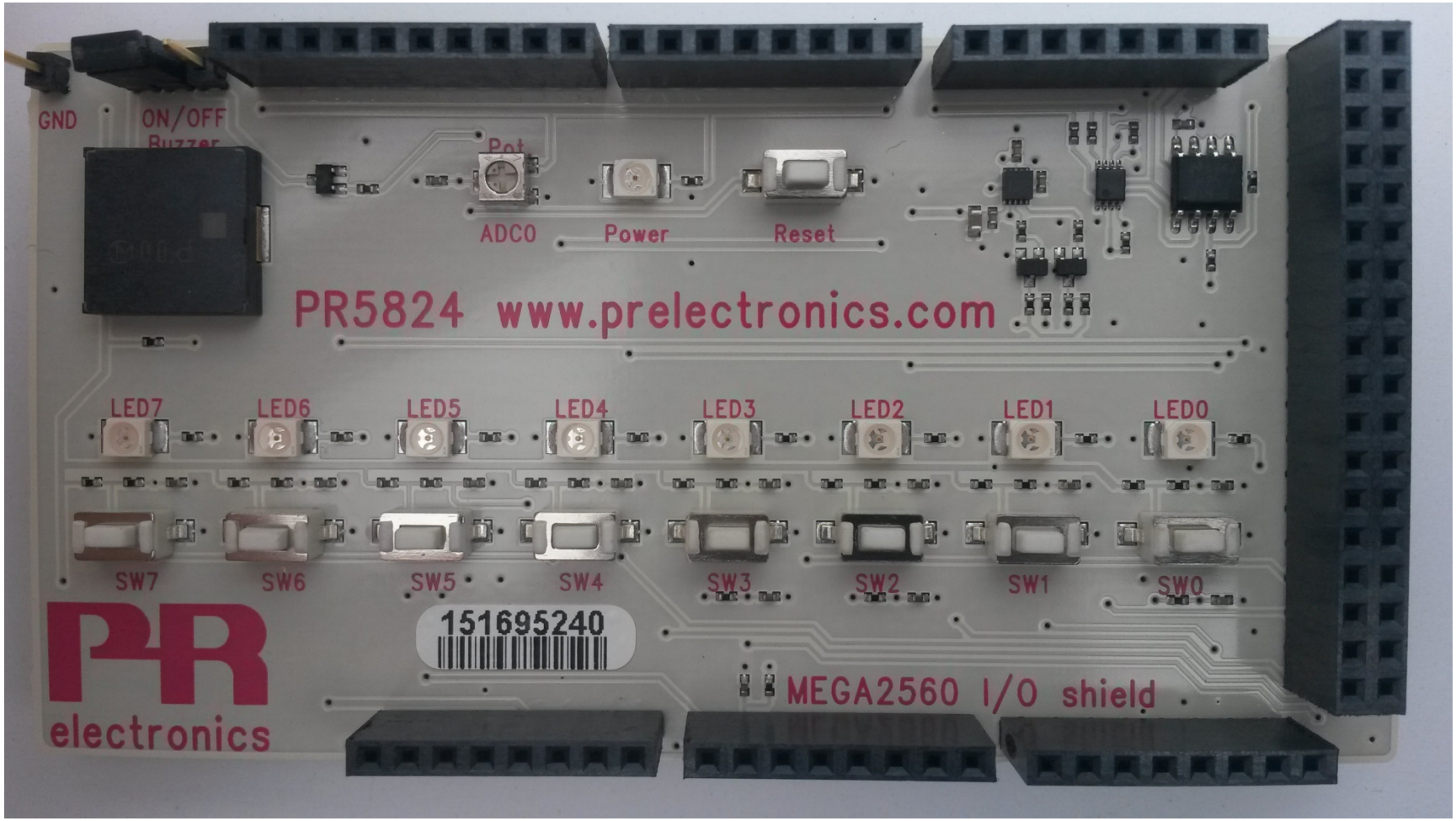
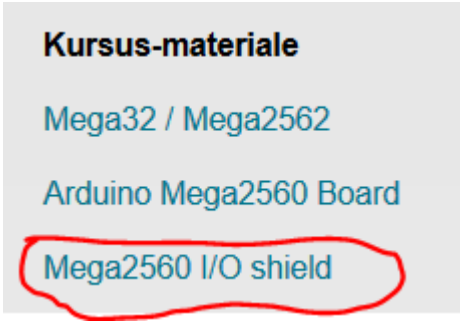
”Mega2560 I/O Shield”



”Mega2560 I/O Shield”

- Power on LED (rød)
- Reset knap
- 8 lyddioder (LED7….LED0) = PORTB
- 8 trykknapper (SW7….SW0) = PORTA
- Lysgiver (buzzer) = PORTB, bit 5
- On/off jumper for lydgiver
- Potentiometer for A/D konverter (ADC0 = PF0)
- Low pass filter for PWM -> Analog
- 2 interrupt trykknapper (INT3 = SW3, INT4 = SW4)
- 1 trykknap for counting (T0 = PD7 = SW0)
- 1 digital temperaturmåler (LM75)
- 1 digital accelerometer (ICMA8652)

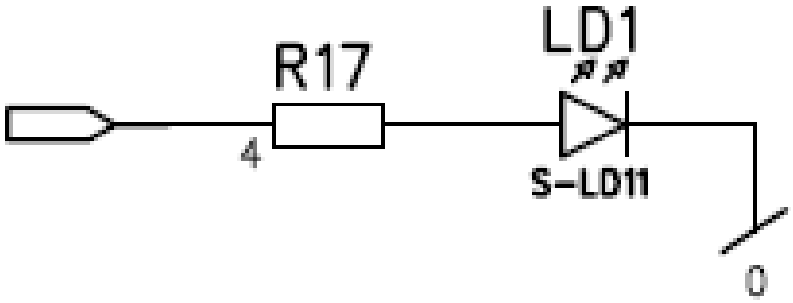


Lysdioderne (LED7….LED0)

PORTB = LED7 – LED0

Lysdiode (en af 8)

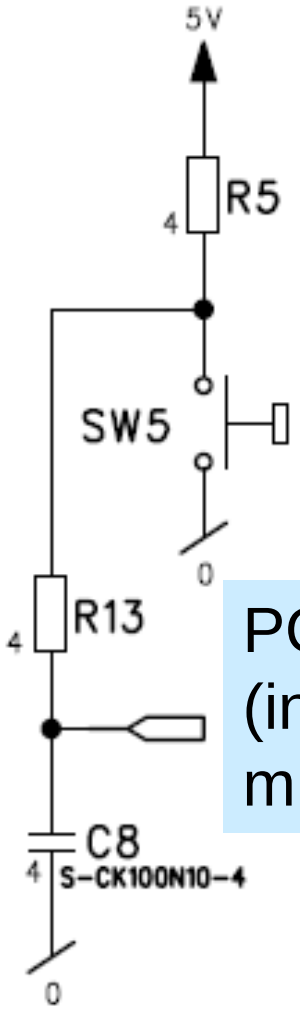
PORTB ben:
0 ud = 0 volt
1 ud = 5 volt



Hvordan virker det ?

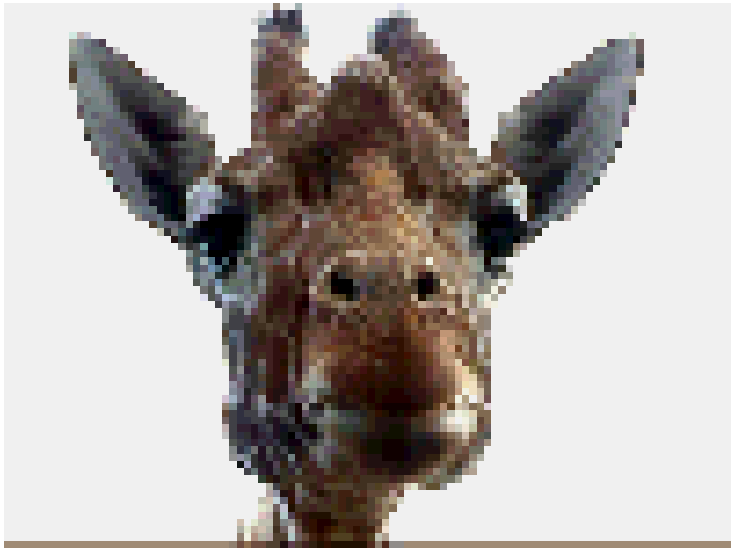
Trykknapperne (SW7….SW0)

Trykknapper (en af 8)



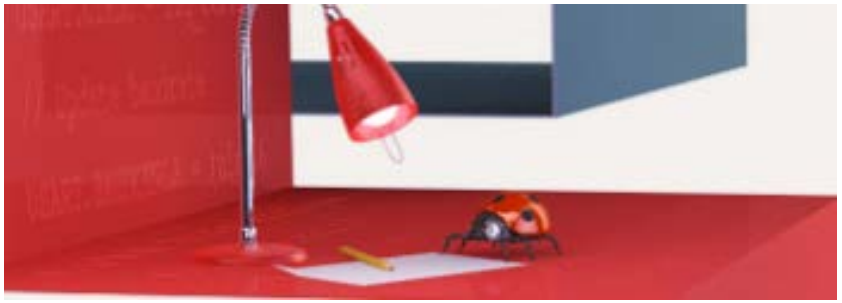
Hvordan virker det ?

Kommentarer?



- eller spørgsmål til vores hardware?

Atmel Studio 6

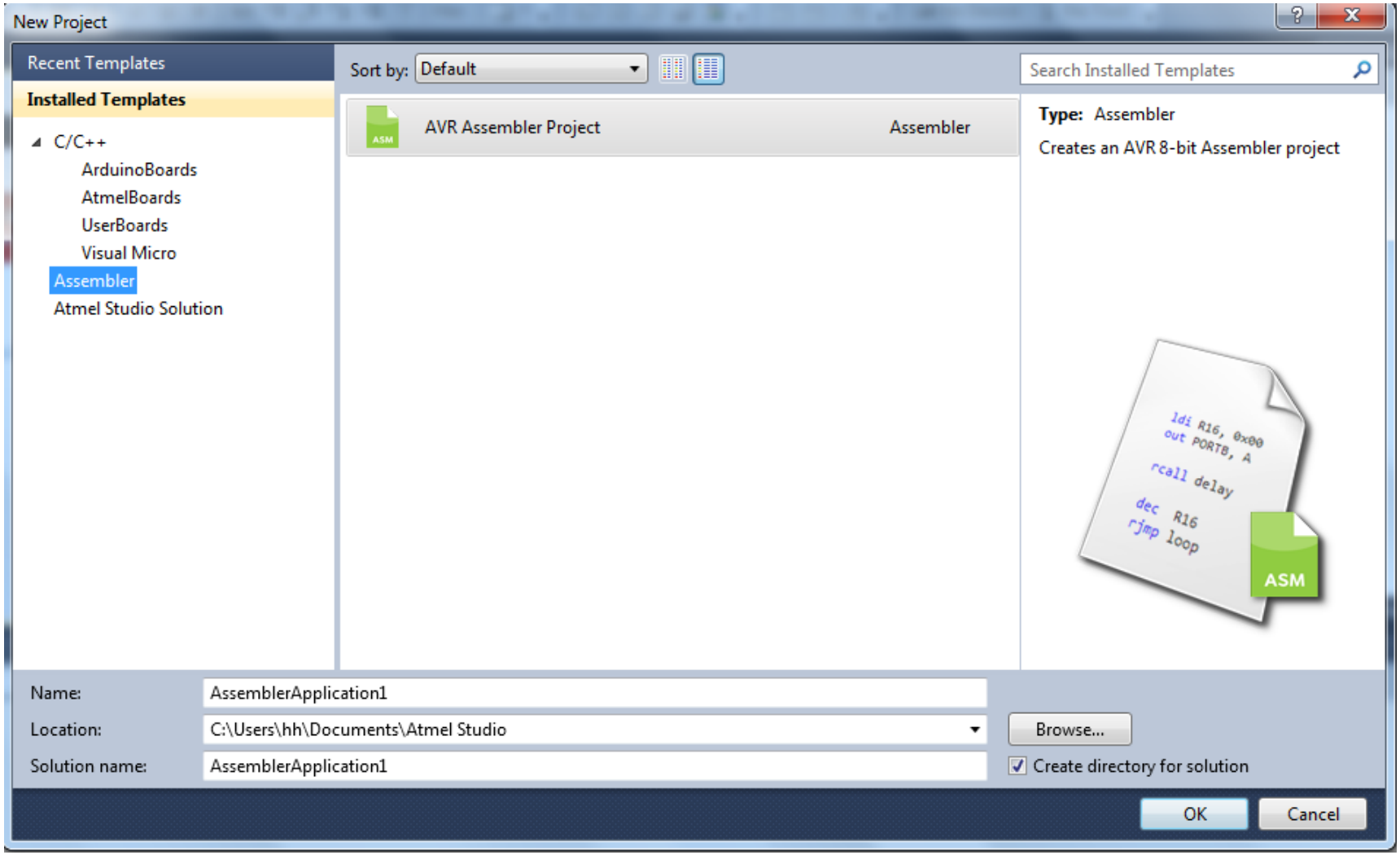


Atmel Studio 6 kan downloades fra www.atmel.com eller fra MSYS Blackboard.

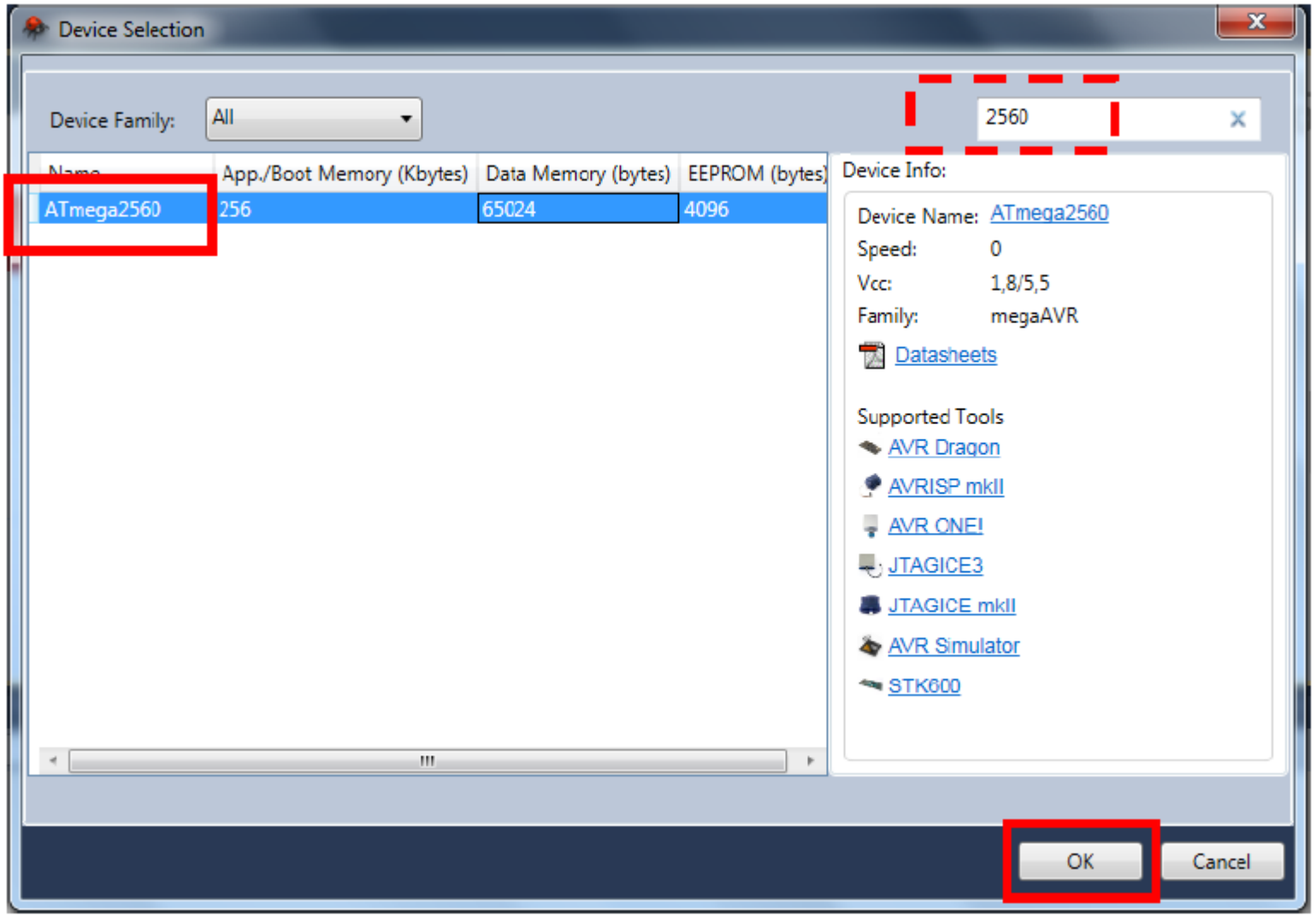
Glimrende (gratis) værktøj, som vi bruger til :

- Skrivning af assembly-programmer.
- Skrivning af C-programmer (eller C++).
- Download af program til ”Arduino Mega2560”.
- Test (simulering) af programmer.

Oprettelse af assembly projekt



Valg af microcontroller (ATmega2560)



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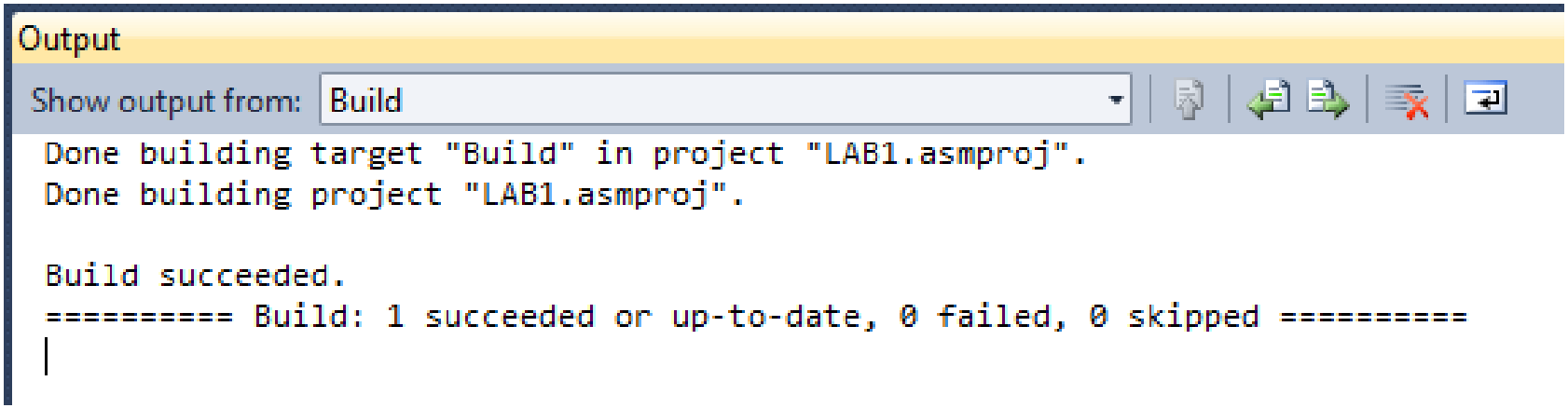
Skriv assembly koden

LAB1.asm

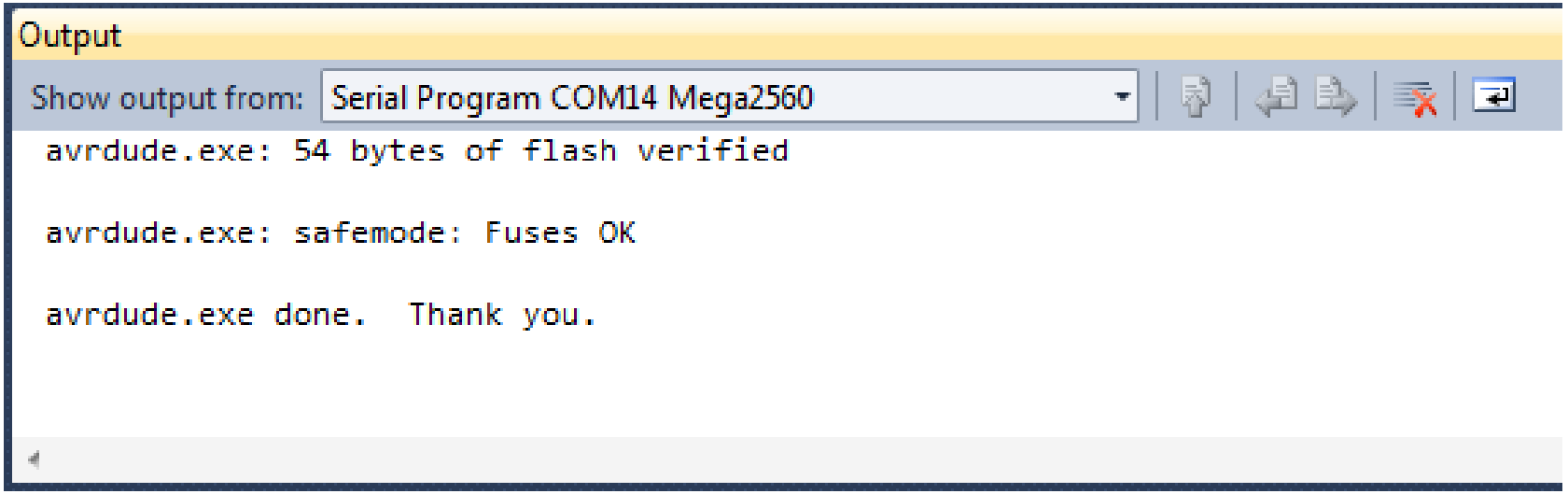
```
;********** MSYS, LAB1 **********
;******* Henning Hargaard *******
;*******  14.august 2015  *******
;********************************

;********** INITIERING **********
   LDI  R16,HIGH(RAMEND) ;Initialize Stack Pointer
   OUT  SPH,R16
   LDI  R16,LOW(RAMEND)
   OUT  SPL,R16
   SER  R16              ;PORTB = Outputs
   OUT  DDRB,R16

;********** PROGRAM-LOOP ********
   CLR  R16
LOOP:
   LDI  R17,9            ;R17 = 9
   ADD  R16,R17          ;R16 = R16 + R17
   CALL DISP_AND_DELAY   ;Display R16
   JMP  LOOP             ;Jump to "LOOP"
```

Build (F7)



Herved assembleres koden (og vi får dannet en ”hex-fil” med maskinkoderne)

Programmering af Mega2560 = Kode



Simulering (debug)

LAB1.asm

```
;********** MSYS, LAB1 **********
;******* Henning Hargaard *******
;*******  14.august 2015  *******
;********************************

;********** INITIERING **********
   LDI  R16,HIGH(RAMEND) ;Initialize Stack Pointer
   OUT  SPH,R16
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   LDI  R17,9            ;R17 = 9
   ADD  R16,R17          ;R16 = R16 + R17
   CALL DISP_AND_DELAY   ;Display R16
   JMP  LOOP             ;Jump to "LOOP"
```
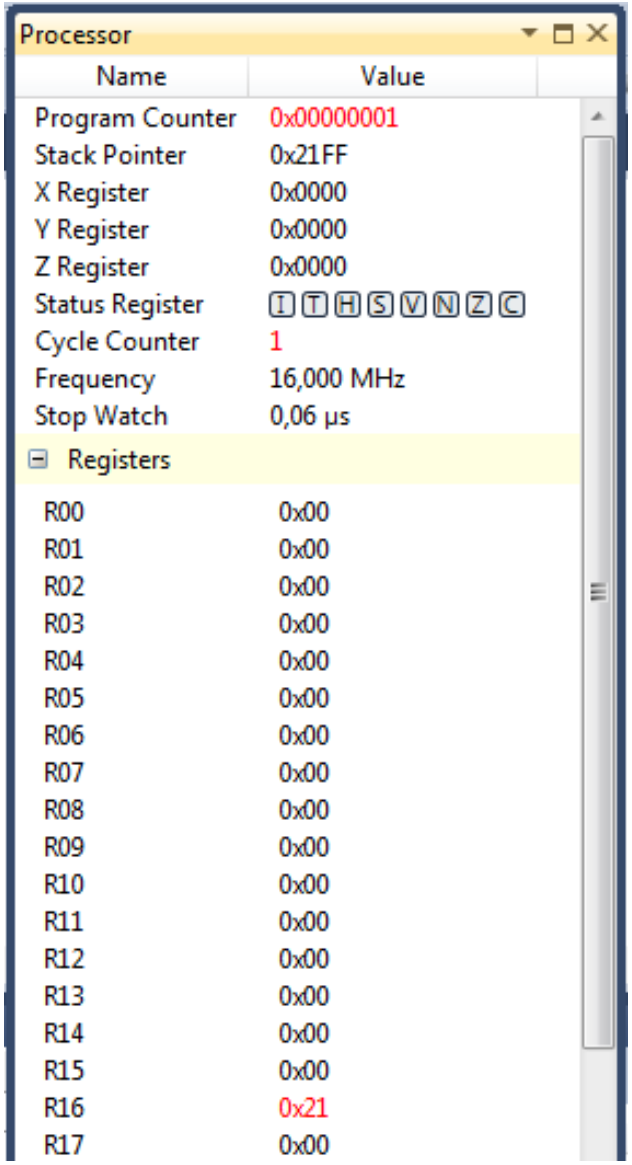
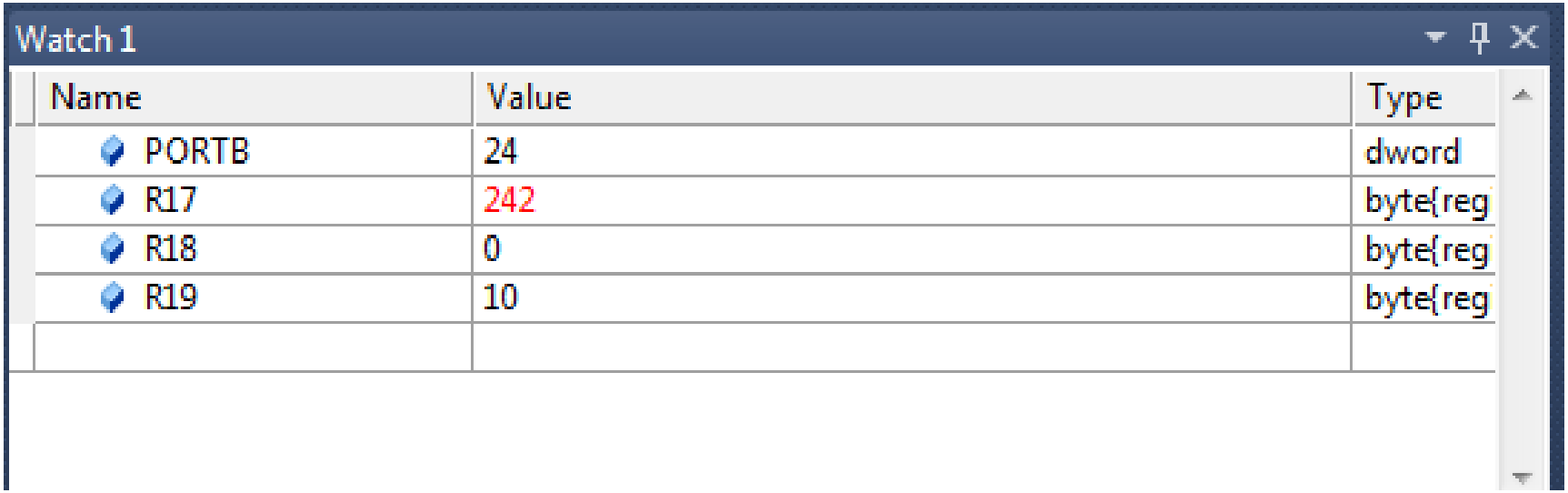

Debug control

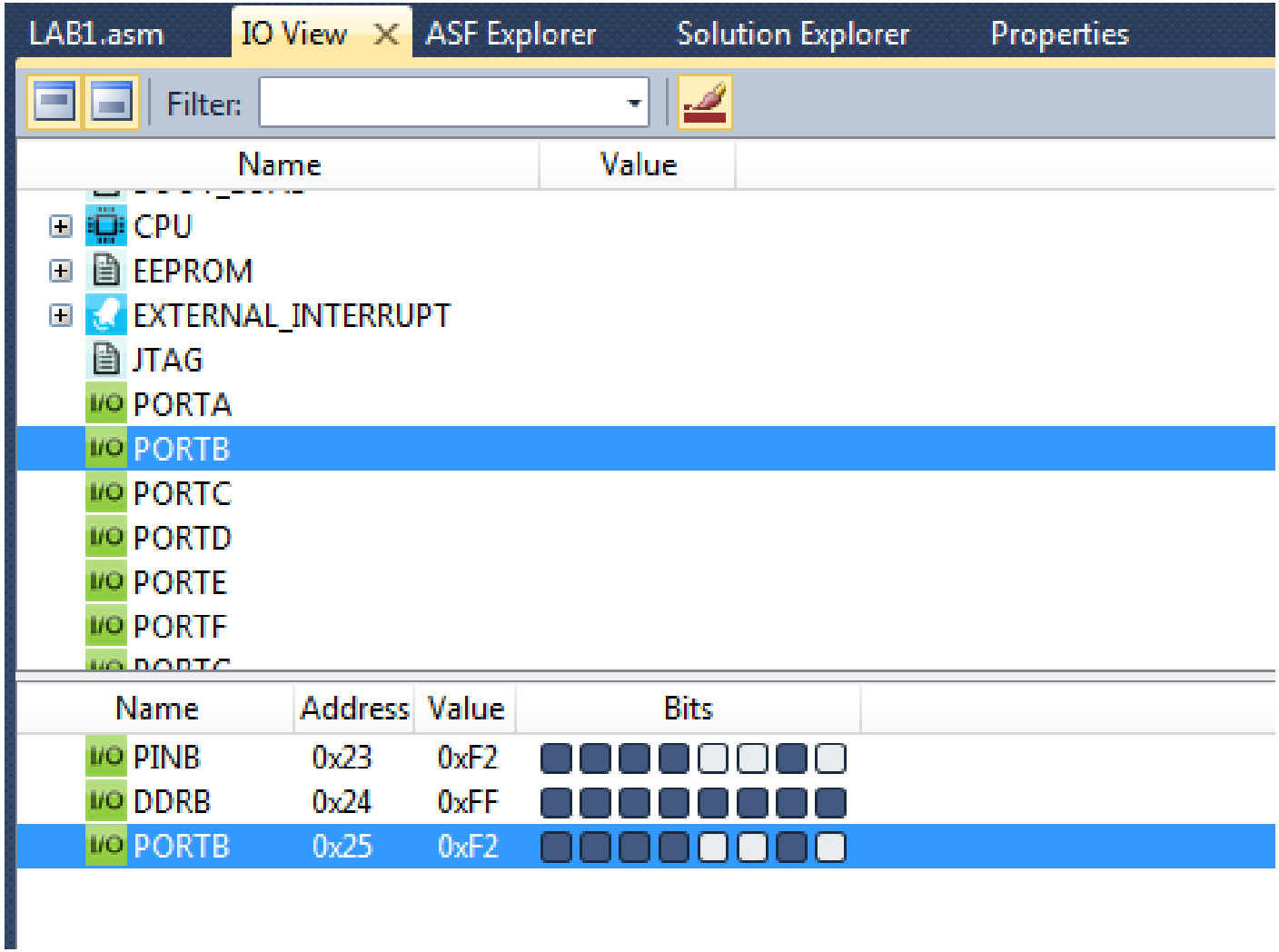
Registre (R0 – R31)



Watch vindue



I/O View


LAB1.asm
IO View
ASF Explorer
Solution Explorer
Properties
Filter:
Name
Value
CPU
EEPROM
EXTERNAL_INTERRUPT
JTAG
PORTA
PORTB
PORTC
PORTD
PORTE
PORTF
Name
Address
Value
Bits
PINB
0x23
0xF2
DDRB
0x24
0xFF
PORTB
0x25
0xF2

Slut på MSYS lektion 3