Ye olde microcontroller.

This schematic also works for:

AT90S4434
AT90S8535
ATmega163
ATmega8535
ATmega323
ATmega16
ATmega32
ATmega644
ATmega1284
ATmega164
ATmega324

Power
File: Power.kicad_sch

Level translators
File: Level translators.kicad_sch

Programming & debug
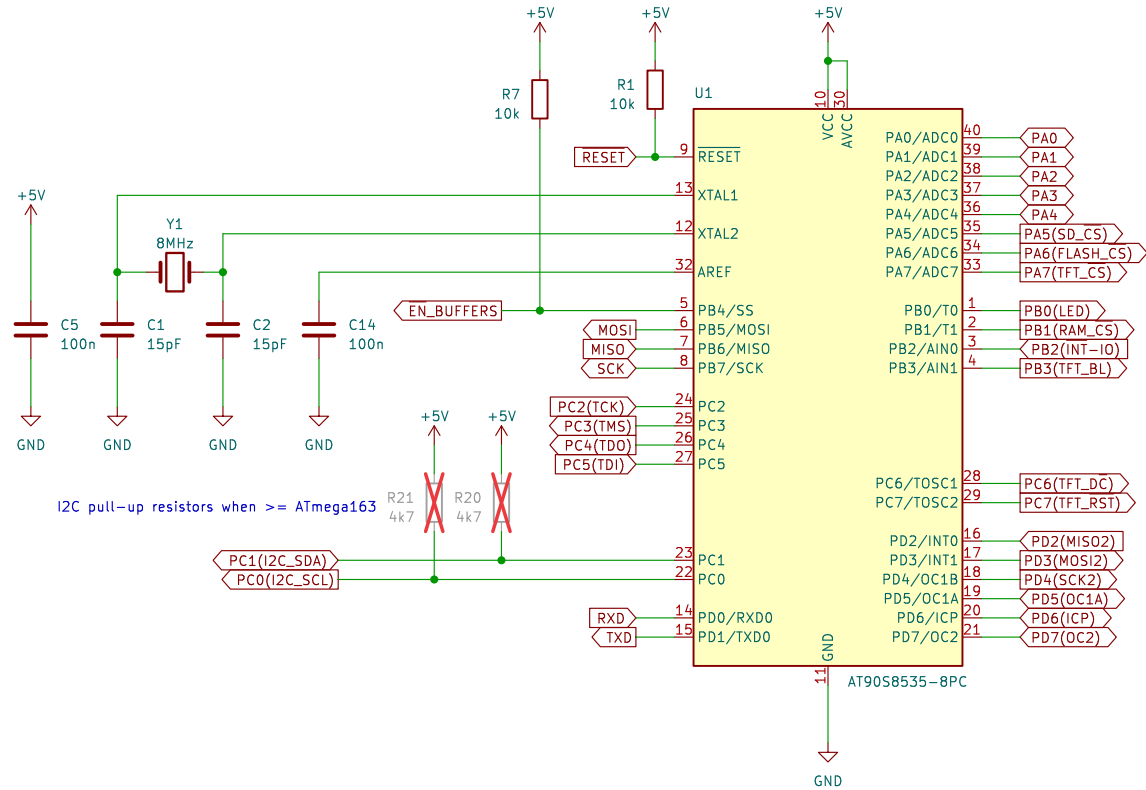File: Programming debug.kicad_sch

IO
File: IO.kicad_sch

Storage & display
File: Storage display.kicad_sch

R7 10k
R1 10k
+5V
+5V
+5V

RESET

U1

C5 100n
C1 15pF
C2 15pF
C14 100n

Y1 8MHz

GND GND GND GND

EN_BUFFERS

MOSI
MISO
SCK

PC2(TCK)
PC3(TMS)
PC4(TDO)
PC5(TDI)

I2C pull-up resistors when >= ATmega163

R21 4k7   R20 4k7
+5V   +5V

PC1(I2C_SDA)
PC0(I2C_SCL)

RXD
TXD

Pin	Signal
10	VCC
30	AVCC
9	RESET
13	XTAL1
12	XTAL2
32	AREF
5	PB4/SS
6	PB5/MOSI
7	PB6/MISO
8	PB7/SCK
24	PC2
25	PC3
26	PC4
27	PC5
23	PC1
22	PC0
14	PD0/RXD0
15	PD1/TXD0

PA0/ADC0 40 PA0
PA1/ADC1 39 PA1
PA2/ADC2 38 PA2
PA3/ADC3 37 PA3
PA4/ADC4 36 PA4
PA5/ADC5 35 PA5(SD_CS)
PA6/ADC6 34 PA6(FLASH_CS)
PA7/ADC7 33 PA7(TFT_CS)

PB0/T0 1 PB0(LED)
PB1/T1 2 PB1(RAM_CS)
PB2/AIN0 3 PB2(INT-IO)
PB3/AIN1 4 PB3(TFT_BL)

PC6/TOSC1 28 PC6(TFT_DC)
PC7/TOSC2 29 PC7(TFT_RST)

PD2/INT0 16 PD2(MISO2)
PD3/INT1 17 PD3(MOSI2)
PD4/OC1B 18 PD4(SCK2)
PD5/OC1A 19 PD5(OC1A)
PD6/ICP 20 PD6(ICP)
PD7/OC2 21 PD7(OC2)

GND 11

AT90S8535-8PC

GND

H1 MountingHole
H2 MountingHole
H3 MountingHole
H4 MountingHole

Sheet: /
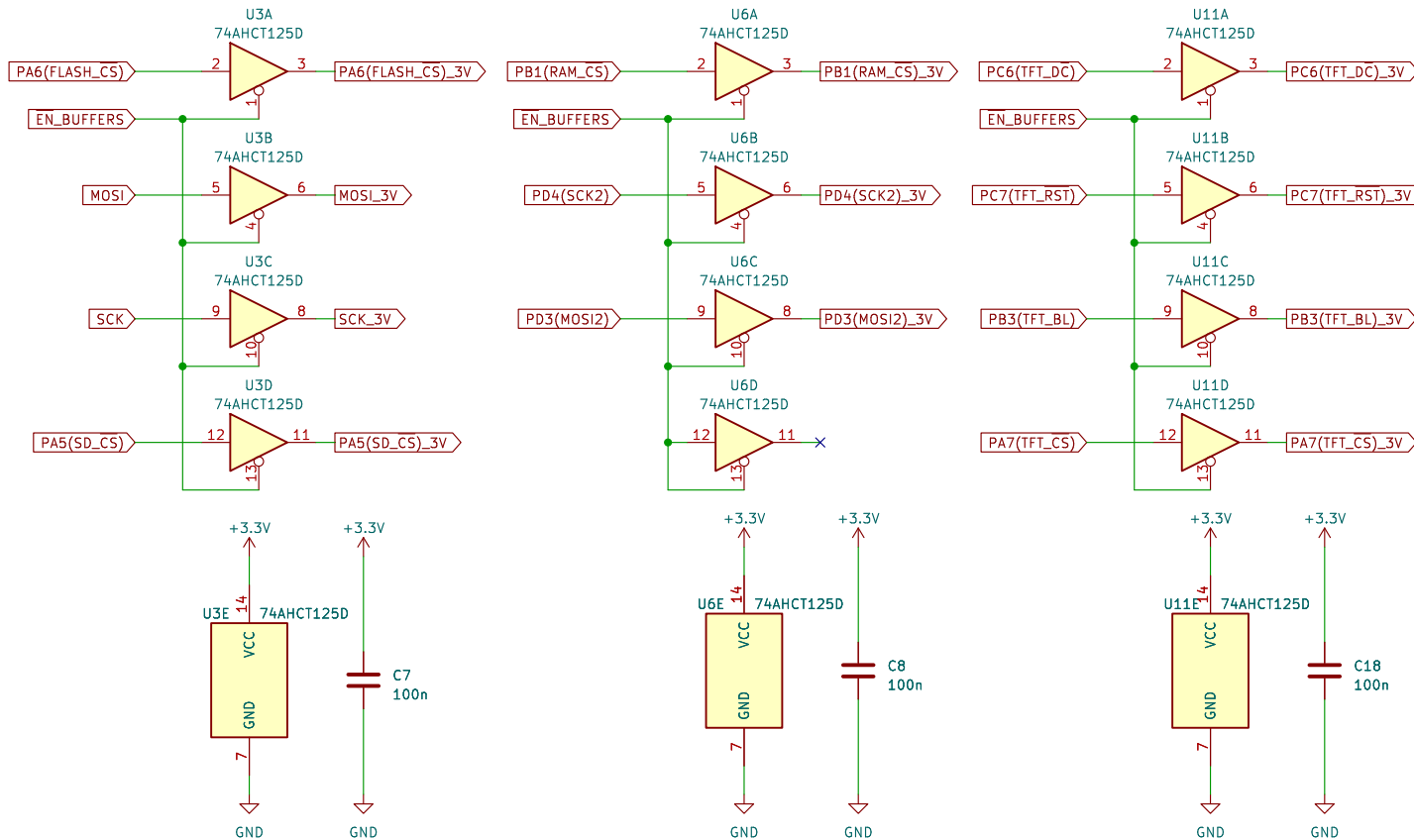File: at90s8535.kicad_sch
Title: AT90S8535 demo board
Size: A4   Date: 2023-04-01   **Rev: V1.0**
KiCad E.D.A. kicad 7.0.1   Id: 1/6

Level translate 5V to 3V3.

U3A
74AHCT125D
PA6(FLASH_CS) — 2 ▷ 3 — PA6(FLASH_CS)_3V
EN_BUFFERS — 1

U3B
74AHCT125D
MOSI — 5 ▷ 6 — MOSI_3V
4

U3C
74AHCT125D
SCK — 9 ▷ 8 — SCK_3V
10

U3D
74AHCT125D
PA5(SD_CS) — 12 ▷ 11 — PA5(SD_CS)_3V
13

U6A
74AHCT125D
PB1(RAM_CS) — 2 ▷ 3 — PB1(RAM_CS)_3V
EN_BUFFERS — 1

U6B
74AHCT125D
PD4(SCK2) — 5 ▷ 6 — PD4(SCK2)_3V
4

U6C
74AHCT125D
PD3(MOSI2) — 9 ▷ 8 — PD3(MOSI2)_3V
10

U6D
74AHCT125D
12 ▷ 11 ✕
13

U11A
74AHCT125D
PC6(TFT_DC) — 2 ▷ 3 — PC6(TFT_DC)_3V
EN_BUFFERS — 1

U11B
74AHCT125D
PC7(TFT_RST) — 5 ▷ 6 — PC7(TFT_RST)_3V
4

U11C
74AHCT125D
PB3(TFT_BL) — 9 ▷ 8 — PB3(TFT_BL)_3V
10

U11D
74AHCT125D
PA7(TFT_CS) — 12 ▷ 11 — PA7(TFT_CS)_3V
13

Level translate 3V3 to 5V.
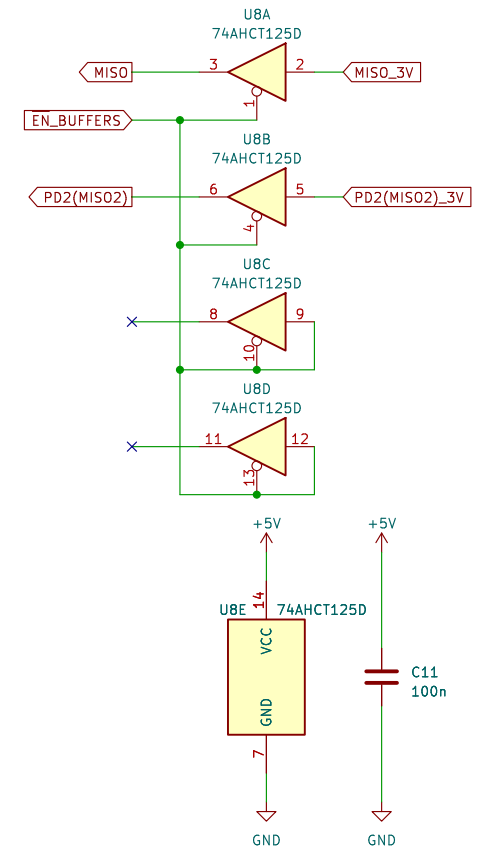
U8A
74AHCT125D
MISO — 3 ▷ 2 — MISO_3V
EN_BUFFERS — 1

U8B
74AHCT125D
PD2(MISO2) — 6 ▷ 5 — PD2(MISO2)_3V
4

U8C
74AHCT125D
✕ — 8 ▷ 9
10

U8D
74AHCT125D
✕ — 11 ▷ 12
13

U3E 14 74AHCT125D +3.3V
VCC
GND 7
GND
C7 100n +3.3V GND

U6E 14 74AHCT125D +3.3V
VCC
GND 7
GND
C8 100n +3.3V GND

U11E 14 74AHCT125D +3.3V
VCC
GND 7
GND
C18 100n +3.3V GND

U8E 14 74AHCT125D +5V
VCC
GND 7
GND
C11 100n +5V GND

9V to 5V and 3V3 linear regulators.

PWR_FLAG

+5V

+3.3V

J3
Barrel_Jack_Switch

D1
1N5819

U2
L7805

U4
AMS1117-3.3

1

3

2

IN OUT

GND

VI VO

GND

C3
100uF 16V

C4
33uF 16V

C9
33uF 16V

PWR_FLAG GND

GND

GND

GND

GND

GND
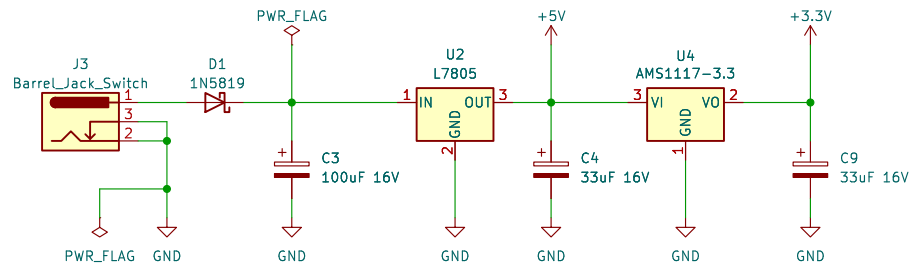
Sheet: /Power/
File: Power.kicad_sch

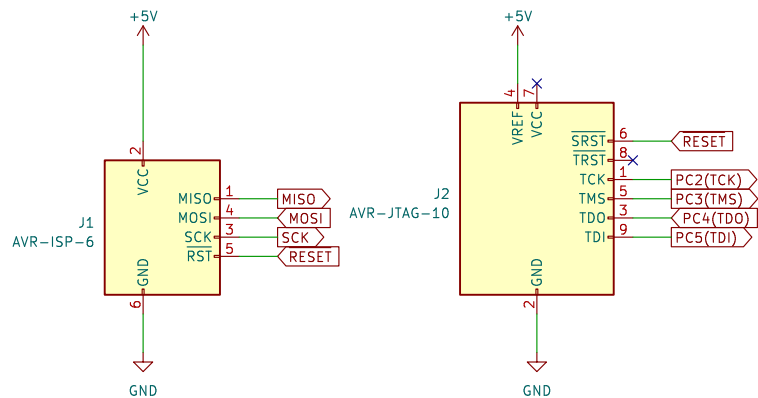**Title: AT90S8535 demo board**

Size: A4 | Date: 2023-04-01 | **Rev: V1.0**
KiCad E.D.A. kicad 7.0.1 | | Id: 3/6

Programming & debug headers.

JTAG debug works for ATmega16 and newer.
AT90S4434, AT90S8535, ATmega163 and ATmega8535 do not have JTAG port.
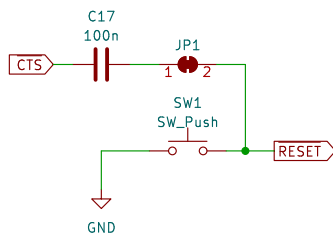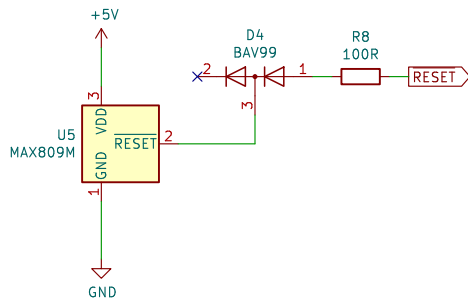
+5V

J1
AVR-ISP-6

VCC 2
MISO 1 — MISO
MOSI 4 — MOSI
SCK 3 — SCK
RST 5 — RESET
GND 6

GND

+5V

J2
AVR-JTAG-10

VREF 4
VCC 7
$\overline{SRST}$ 6 — RESET
$\overline{TRST}$ 8
TCK 1 — PC2(TCK)
TMS 5 — PC3(TMS)
TDO 3 — PC4(TDO)
TDI 9 — PC5(TDI)
GND 2

GND

Blinkenlight.

PB0(LED)

D8
Blue

R16
1k

GND
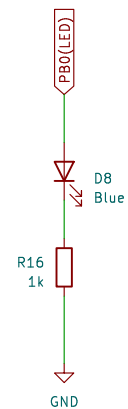
Reset button and auto reset programming.

Open JP1 to disable auto reset.

C17
100n

CTS

JP1
1 2

SW1
SW_Push

RESET

GND

Voltage monitor.

Only needed for devices without BOD like AT90S4434 or AT90S8535

+5V

D4
BAV99

R8
100R

RESET

U5
MAX809M

VDD 3
RESET 2
GND 1

GND

Title: AT90S8535 demo board

Size: A4 | Date: 2023-04-01 | **Rev: V1.0**
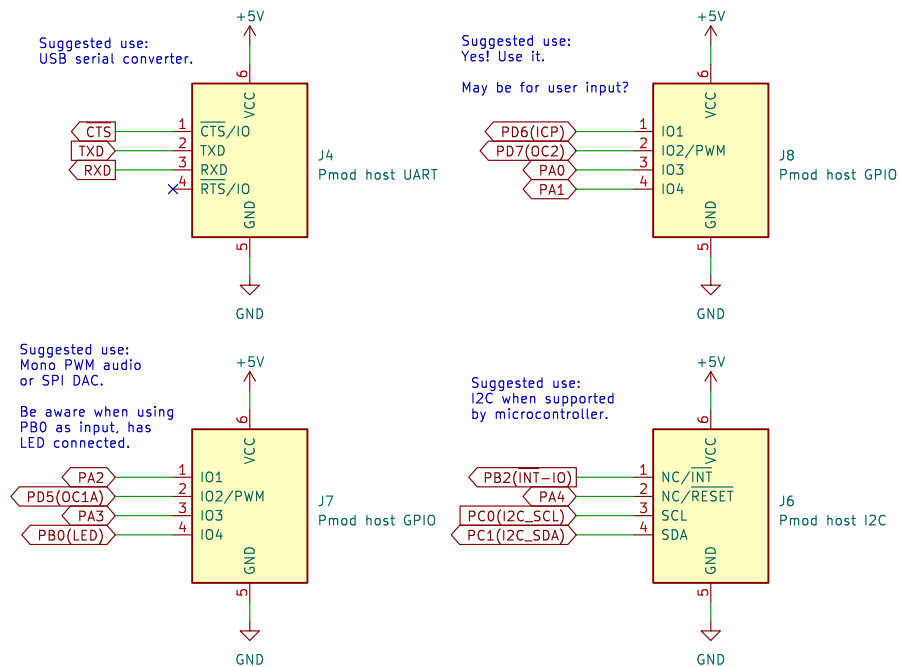KiCad E.D.A. kicad 7.0.1 | Id: 4/6

5V IO connectors.

These have PMOD pinouts. Except they work with 5V VCC and 5V IO.

Suggested use:
USB serial converter.

+5V

CTS	1	CTS/IO	VCC
TXD	2	TXD	
RXD	3	RXD	
	4	RTS/IO	GND

J4
Pmod host UART

GND

Suggested use:
Yes! Use it.

May be for user input?

+5V

PD6(ICP)	1	IO1	VCC
PD7(OC2)	2	IO2/PWM	
PA0	3	IO3	
PA1	4	IO4	GND

J8
Pmod host GPIO

GND

Suggested use:
Mono PWM audio
or SPI DAC.

Be aware when using
PB0 as input, has
LED connected.

+5V

PA2	1	IO1	VCC
PD5(OC1A)	2	IO2/PWM	
PA3	3	IO3	
PB0(LED)	4	IO4	GND

J7
Pmod host GPIO

GND

Suggested use:
I2C when supported
by microcontroller.

+5V

PB2(INT-IO)	1	NC/INT	VCC
PA4	2	NC/RESET	
PC0(I2C_SCL)	3	SCL	
PC1(I2C_SDA)	4	SDA	GND

J6
Pmod host I2C

GND

Sheet: /IO/
File: IO.kicad_sch

Title: AT90S8535 demo board

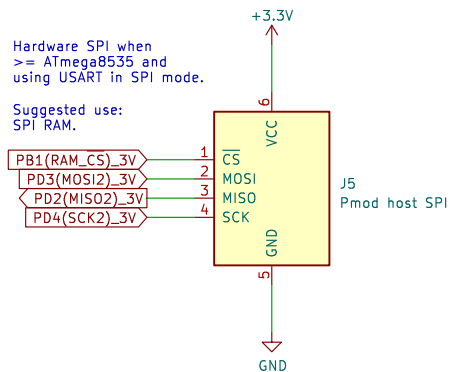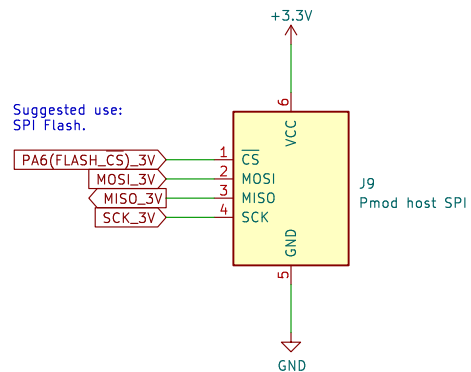| Size: A4	Date: 2023-04-01	Rev: V1.0
KiCad E.D.A. kicad 7.0.1		Id: 5/6

3.3V IO connectors.

These have PMOD pinouts and work on 3.3V.

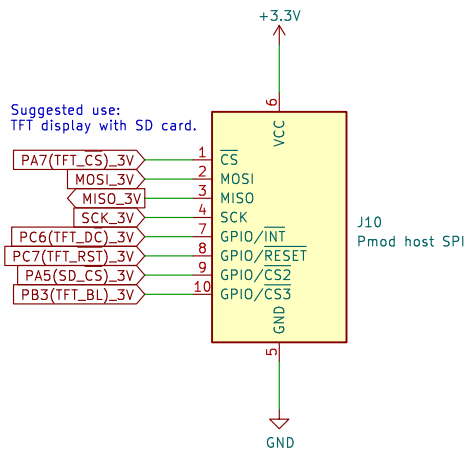Hardware SPI when
>= ATmega8535 and
using USART in SPI mode.

Suggested use:
SPI RAM.

J5
Pmod host SPI

- +3.3V → 6 VCC
- PB1(RAM_CS)_3V → 1 $\overline{CS}$
- PD3(MOSI2)_3V → 2 MOSI
- PD2(MISO2)_3V → 3 MISO
- PD4(SCK2)_3V → 4 SCK
- 5 GND → GND

Suggested use:
SPI Flash.

J9
Pmod host SPI

- +3.3V → 6 VCC
- PA6(FLASH_CS)_3V → 1 $\overline{CS}$
- MOSI_3V → 2 MOSI
- MISO_3V → 3 MISO
- SCK_3V → 4 SCK
- 5 GND → GND

Suggested use:
TFT display with SD card.

J10
Pmod host SPI

- +3.3V → 6 VCC
- PA7(TFT_CS)_3V → 1 $\overline{CS}$
- MOSI_3V → 2 MOSI
- MISO_3V → 3 MISO
- SCK_3V → 4 SCK
- PC6(TFT_DC)_3V → 7 GPIO/$\overline{INT}$
- PC7(TFT_RST)_3V → 8 GPIO/$\overline{RESET}$
- PA5(SD_CS)_3V → 9 GPIO/$\overline{CS2}$
- PB3(TFT_BL)_3V → 10 GPIO/$\overline{CS3}$
- 5 GND → GND

Sheet: /Storage & display/
File: Storage display.kicad_sch

Title: AT90S8535 demo board

Size: A4 | Date: 2023-04-01 | **Rev: V1.0**
KiCad E.D.A. kicad 7.0.1 | | Id: 6/6