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
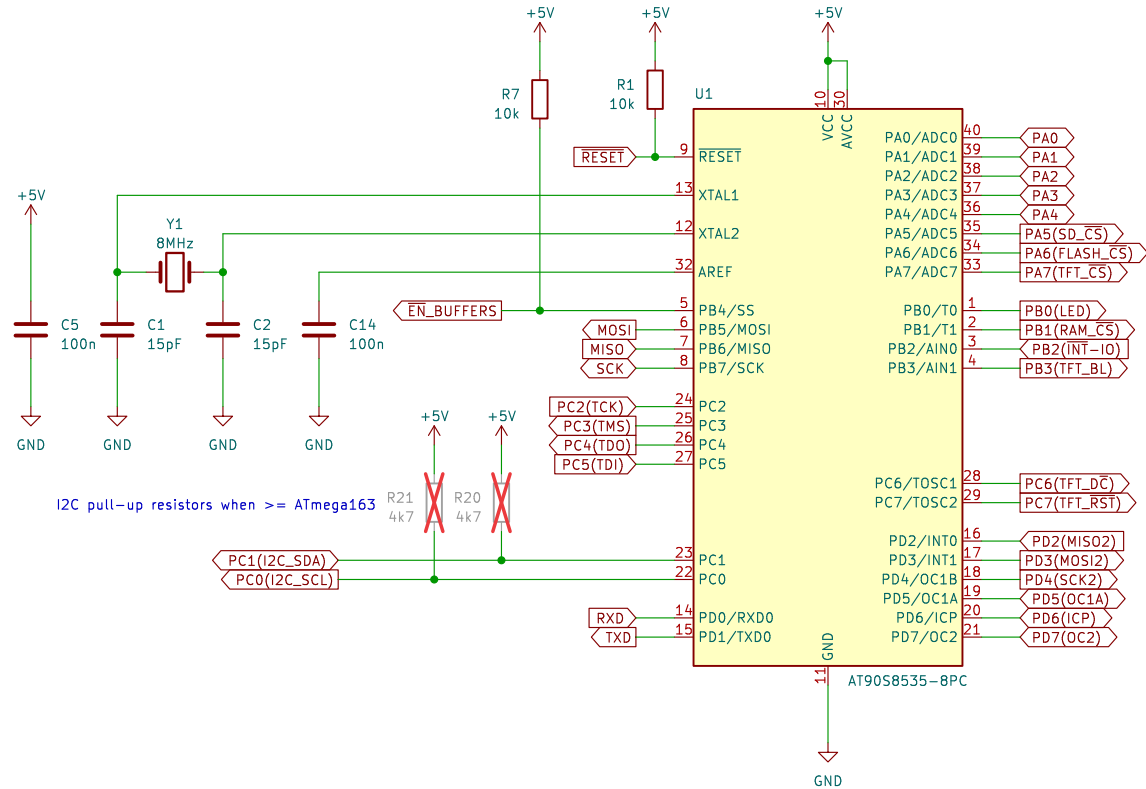
IO
File: IO.kicad_sch

Storage & display
File: Storage display.kicad_sch

H1
MountingHole

H2
MountingHole

H3
MountingHole

H4
MountingHole

R7
10k

R1
10k

U1

RESET

+5V

C5
100n

C1
15pF

Y1
8MHz

C2
15pF

C14
100n

GND

GND

GND

GND

I2C pull-up resistors when >= ATmega163

R21
4k7

R20
4k7

+5V

+5V

PC1(I2C_SDA)
PC0(I2C_SCL)

RXD
TXD

MOSI
MISO
SCK

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

RESET

VCC
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
PA1/ADC1   39
PA2/ADC2   38
PA3/ADC3   37
PA4/ADC4   36
PA5/ADC5   35
PA6/ADC6   34
PA7/ADC7   33

PB0/T0   1
PB1/T1   2
PB2/AIN0   3
PB3/AIN1   4

PC6/TOSC1 28
PC7/TOSC2 29

PD2/INT0   16
PD3/INT1   17
PD4/OC1B   18
PD5/OC1A   19
PD6/ICP   20
PD7/OC2   21

PA0
PA1
PA2
PA3
PA4
PA5(SD_CS)
PA6(FLASH_CS)
PA7(TFT_CS)

PB0(LED)
PB1(RAM_CS)
PB2(INT-IO)
PB3(TFT_BL)

PC6(TFT_DC)
PC7(TFT_RST)

PD2(MISO2)
PD3(MOSI2)
PD4(SCK2)
PD5(OC1A)
PD6(ICP)
PD7(OC2)

10
30

EN_BUFFERS

11   GND

GND

AT90S8535-8PC

Sheet: /
File: at90s8535.kicad_sch
Title: AT90S8535 demo board
Size: A4   Date: 2023-04-01   **Rev: V1.0**
KiCad E.D.A. kicad 7.0.10   Id: 1/6

Level translate 5V to 3V3.

U3A
74AHC125D
PA6(FLASH_CS) → 2 → 3 → PA6(FLASH_CS)_3V

EN_BUFFERS → 1

U3B
74AHC125D
MOSI → 5 → 6 → MOSI_3V

4

U3C
74AHC125D
SCK → 9 → 8 → SCK_3V

10

U3D
74AHC125D
PA5(SD_CS) → 12 → 11 → PA5(SD_CS)_3V

13

U3E 14 **74AHC125D**
VCC
+3.3V

+3.3V
C7
100n

GND GND GND

U6A
74AHC125D
PB1(RAM_CS) → 2 → 3 → PB1(RAM_CS)_3V

EN_BUFFERS → 1

U6B
74AHC125D
PD4(SCK2) → 5 → 6 → PD4(SCK2)_3V

4

U6C
74AHC125D
PD3(MOSI2) → 9 → 8 → PD3(MOSI2)_3V

10

U6D
74AHC125D
12 → 11 ✕

13

U6E 14 **74AHC125D**
VCC
+3.3V

+3.3V
C8
100n

GND GND GND

U11A
74AHC125D
PC6(TFT_DC) → 2 → 3 → PC6(TFT_DC)_3V

EN_BUFFERS → 1

U11B
74AHC125D
PC7(TFT_RST) → 5 → 6 → PC7(TFT_RST)_3V

4

U11C
74AHC125D
PB3(TFT_BL) → 9 → 8 → PB3(TFT_BL)_3V

10

U11D
74AHC125D
PA7(TFT_CS) → 12 → 11 → PA7(TFT_CS)_3V

13

U11E 14 **74AHC125D**
VCC
+3.3V

+3.3V
C18
100n

GND GND GND

Level translate 3V3 to 5V.
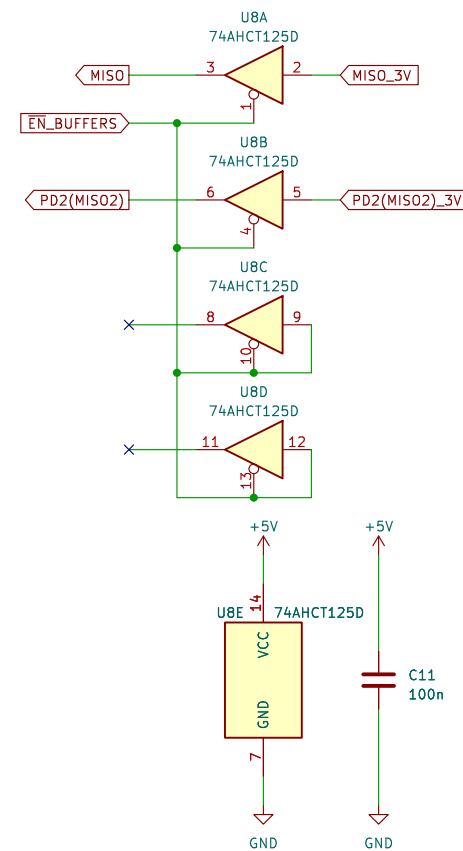
U8A
74AHCT125D
MISO → 3 → 2 → MISO_3V

EN_BUFFERS → 1

U8B
74AHCT125D
PD2(MISO2) → 6 → 5 → PD2(MISO2)_3V

4

U8C
74AHCT125D
✕ 8 → 9

10

U8D
74AHCT125D
✕ 11 → 12

13

U8E 14 **74AHCT125D**
VCC
+5V

+5V
C11
100n

GND GND GND

9V to 5V and 3V3 linear regulators.

J3
Barrel_Jack_Switch

D1
1N5819

PWR_FLAG

U2
L7805
IN OUT
GND

+5V

C3
100uF 16V

C4
33uF 16V

U4
AMS1117-3.3
VI VO
GND

+3.3V

C9
33uF 16V

PWR_FLAG   GND   GND   GND   GND   GND
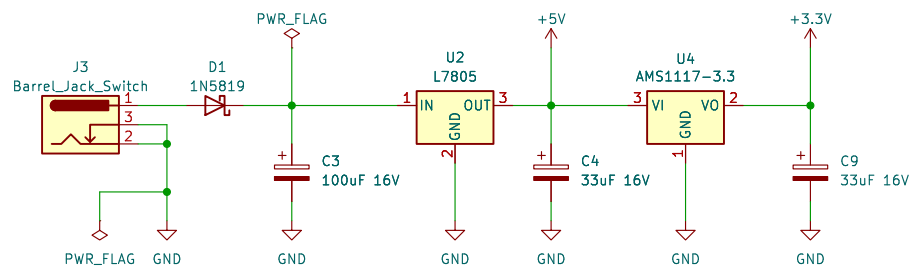
Sheet: /Power/
File: Power.kicad_sch
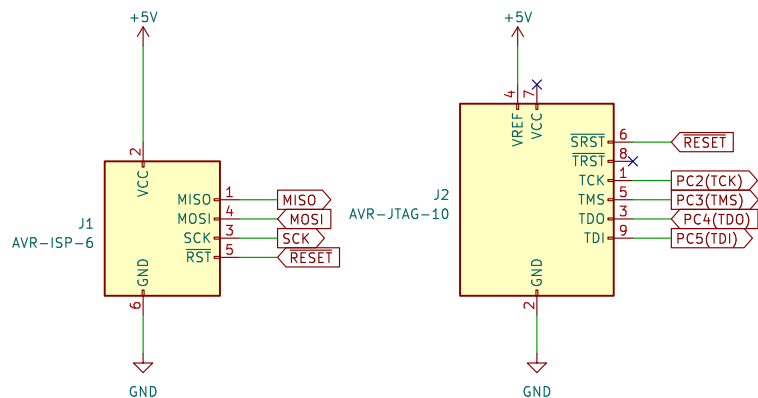**Title: AT90S8535 demo board**
Size: A4 | Date: 2023-04-01 | **Rev: V1.0**
KiCad E.D.A. kicad 7.0.10 | Id: 3/6

Programming & debug headers.

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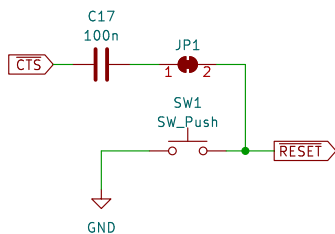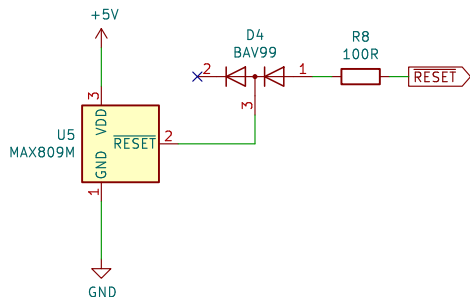AT90S4434, AT90S8535, ATmega163 and ATmega8535 do not have JTAG port.

+5V

J1
AVR-ISP-6

VCC 2
GND 6

MISO 1 → MISO
MOSI 4 → MOSI
SCK 3 → SCK
RST 5 → RESET

GND

+5V

J2
AVR-JTAG-10

VREF 4
VCC 7

GND 2

$\overline{SRST}$ 6 → RESET
$\overline{TRST}$ 8
TCK 1 → PC2(TCK)
TMS 5 → PC3(TMS)
TDO 3 → PC4(TDO)
TDI 9 → PC5(TDI)

GND

Blinkenlight.

PB0(LED)

D8
Blue

R16
10k

GND
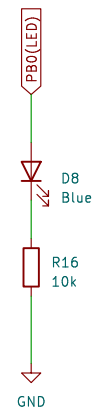
Reset button and auto reset programming.

Open JP1 to disable auto reset.

CTS

C17
100n

JP1
1   2

SW1
SW_Push

RESET

GND

Voltage monitor.

Only needed for devices without BOD like AT90S4434 or AT90S8535

+5V

U5
MAX809M

VDD 3
GND 1
RESET 2

D4
BAV99
2   3   1

R8
100R

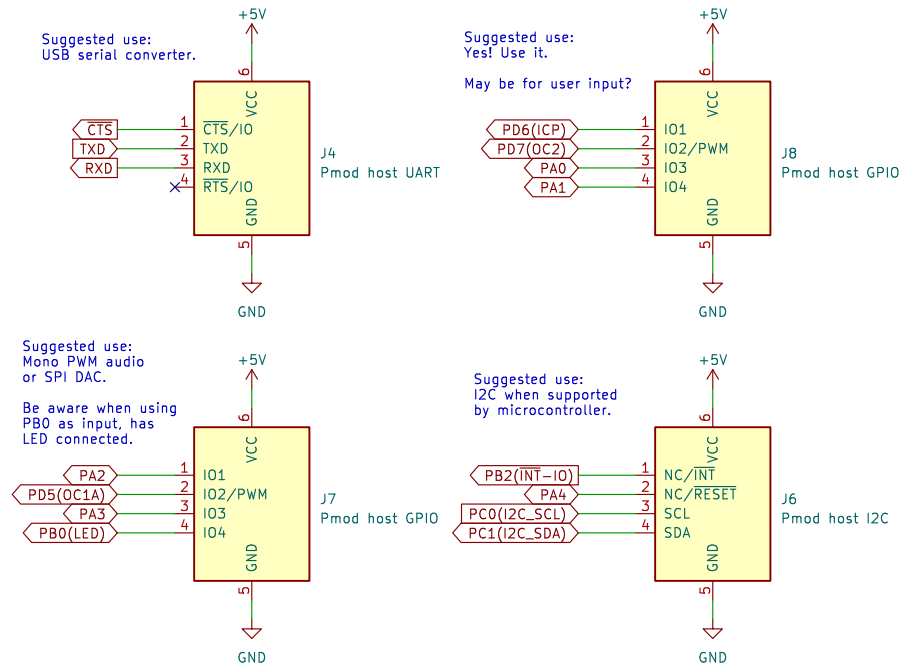RESET

GND

Title: AT90S8535 demo board

Size: A4   Date: 2023-04-01   Rev: V1.0
KiCad E.D.A. kicad 7.0.10   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

1	CTS/IO	VCC	6
2	TXD		
3	RXD		
4	RTS/IO	GND	5

CTS
TXD
RXD

J4
Pmod host UART

GND

Suggested use:
Yes! Use it.

May be for user input?

+5V

1	IO1	VCC	6
2	IO2/PWM		
3	IO3		
4	IO4	GND	5

PD6(ICP)
PD7(OC2)
PA0
PA1

J8
Pmod host GPIO

GND

Suggested use:
Mono PWM audio
or SPI DAC.

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

+5V

1	IO1	VCC	6
2	IO2/PWM		
3	IO3		
4	IO4	GND	5

PA2
PD5(OC1A)
PA3
PB0(LED)

J7
Pmod host GPIO

GND

Suggested use:
I2C when supported
by microcontroller.

+5V

1	NC/INT	VCC	6
2	NC/RESET		
3	SCL		
4	SDA	GND	5

PB2(INT-IO)
PA4
PC0(I2C_SCL)
PC1(I2C_SDA)

J6
Pmod host I2C

GND

Sheet: /IO/
File: IO.kicad_sch

Title: AT90S8535 demo board

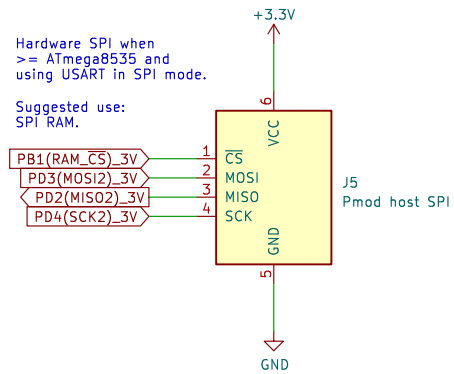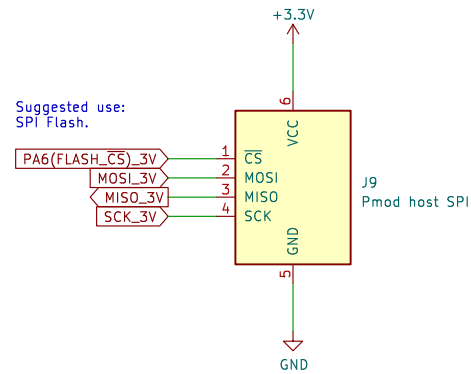| Size: A4 | Date: 2023-04-01 | Rev: V1.0 |
| KiCad E.D.A. kicad 7.0.10 | | Id: 5/6 |

3.3V IO connectors.
These have PMOD pinouts and work on 3.3V.

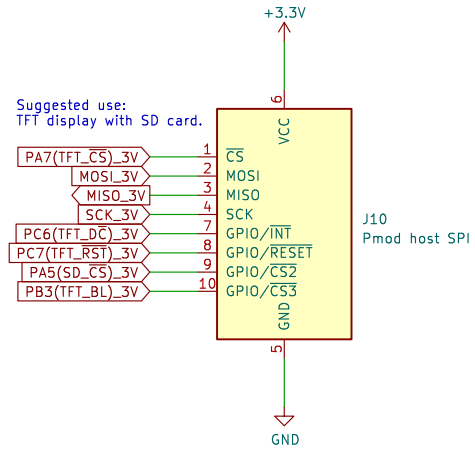Hardware SPI when
>= ATmega8535 and
using USART in SPI mode.

Suggested use:
SPI RAM.

+3.3V

PB1(RAM_CS)_3V — 1 — CS
PD3(MOSI2)_3V — 2 — MOSI
PD2(MISO2)_3V — 3 — MISO
PD4(SCK2)_3V — 4 — SCK

VCC 6
GND 5

J5
Pmod host SPI

GND

Suggested use:
SPI Flash.

+3.3V

PA6(FLASH_CS)_3V — 1 — CS
MOSI_3V — 2 — MOSI
MISO_3V — 3 — MISO
SCK_3V — 4 — SCK

VCC 6
GND 5

J9
Pmod host SPI

GND

Suggested use:
TFT display with SD card.

+3.3V

PA7(TFT_CS)_3V — 1 — CS
MOSI_3V — 2 — MOSI
MISO_3V — 3 — MISO
SCK_3V — 4 — SCK
PC6(TFT_DC)_3V — 7 — GPIO/INT
PC7(TFT_RST)_3V — 8 — GPIO/RESET
PA5(SD_CS)_3V — 9 — GPIO/CS2
PB3(TFT_BL)_3V — 10 — GPIO/CS3

VCC 6
GND 5

J10
Pmod host SPI

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 7.0.10   Id: 6/6