

SPI Protocol

THE ART OF MICROCONTROLLER AND EMBEDDED SYSTEMS USING ASSURANT AND C

SEPEHR NAIMI

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MOHAMMAD ALI MAZIDI
SEPEHR NAIMI
FAHAR NAIMI

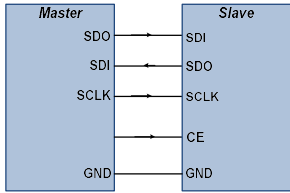
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SPI Protocol

- Synchronous
- Full-duplex
- Serial
- Fast communication
- For short distances
- Pins
 - SDO (Data Out)
 - SDI (Data In)
 - SCLK (shift clock)
 - CE (chip enable)



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Master vs. Slave

- Master begins the communication by pulling down the CE pin of slave.
- Master makes the clock for communication

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SPI internal circuit

- A shift register in the master and another in the slave
- By each clock, a bit is shifted out from the master's shift register into the slave shift register and a bit is shifted from slave to master.

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Multi-slave communication

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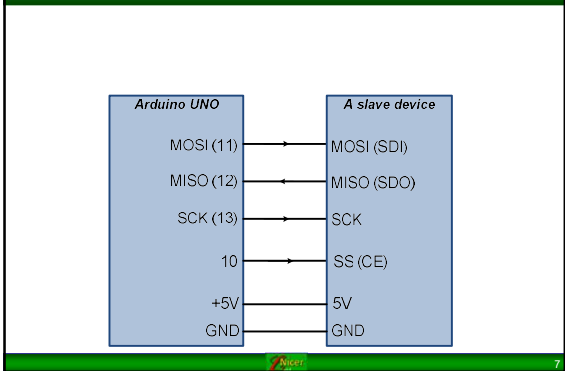
SPI pins in AVR

- MOSI (Master Out Slave In)
- MISO (Master In Slave Out)
- SCK
- SS

28 pin			
(PCINT14/RESET) PD6	1	28	PC5 (ADC5/SCL/PCINT13)
(PCINT16/RXD) PD0	2	27	PC4 (ADC4/SDA/PCINT12)
(PCINT17/TXD) PD1	3	26	PC3 (ADC3/PCINT11)
(PCINT18/INT0) PD2	4	25	PC2 (ADC2/PCINT10)
(PCINT19/OC2B/INT1) PD3	5	24	PC1 (ADC1/PCINT9)
(PCINT20/CK/T0) PD4	6	23	PC0 (ADC0/PCINT8)
VCC	7	22	GND
GND	8	21	AREF
(PCINT6/XTAL1/TOSC1) PB6	9	20	AVCC
(PCINT7/XTAL2/TOSC2) PB7	10	19	PB6 (SCK/PCINT6)
(PCINT21/OC0B) PD5	11	18	PB4 (MISO/PCINT4)
(PCINT22/OC0A/AIN0) PD6	12	17	PB3 (MOSI/OC2A/PCINT3)
(PCINT23/AIN1) PD7	13	16	PB2 (SS/OC1B/PCINT2)
(PCINT0/CLK0/CP1) PB0	14	15	PB1 (OC1A/PCINT1)

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Connecting a slave device to an AVR



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AVR registers

- Control register:
 - SPCR (SPI Control Register)
- Status Register:
 - SPSR (SPI Status Register)
- Data Register:
 - SPDR (SPI Data Register)

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SPSR (SPI Status Register)

SPSR:

SPIF	WCOL	-	-	-	-	-	SPI2X
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- SPIF (SPI Interrupt Flag)
 - A serial transfer is completed.
 - The SS pin is driven low in slave mode
- WCOL (Write Collision)
- SPI2X (Double SPI Speed)

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