



Module 11

Quiz: Liquid Crystal Display



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The SPI status register is located at **EUSCI_A3->STATW** (bit 0 is **UCBUSY**)

The SPI flag register is located at **EUSCI_A3->IFG** (bit 0 is **RXIFG**, and bit 1 is **TXIFG**)

The 8-bit output data register is located at **EUSCI_A3->TXBUF**

The 8-bit input data register is located at **EUSCI_A3->RXBUF**

Q1 Busy-wait synchronization

Assume an output peripheral device is interfaced to UCA3 on the MSP432. The MSP432 is the master. Use busy-wait synchronization on **UCBUSY** to write a function that outputs an 8-bit value to the device.

- a) There are two options for busy-wait synchronization. 1) Wait for **UCBUSY** to be 0, then output. 2) Output, then wait for **UCBUSY** to be 0. Given a complex system with many tasks to perform, which option is more efficient?
- b) Write the function that has the following prototype is
 - `void SPI_OutByte(uint8_t data);`
- c) Write the function that outputs 100 bytes to the device. The function should have the following prototype is
 - `void SPI_OutBuffer(uint8_t buf[100]);`

Q2 Busy-wait synchronization

Assume an input peripheral device is interfaced to UCA3 on the MSP432. The MSP432 is the master. Use busy-wait synchronization on **RXIFG** to write a function that inputs an 8-bit value to the device. Write the function that has the following prototype is

```
uint8_t SPI_InByte(void);
```

Q3 Speed of SPI

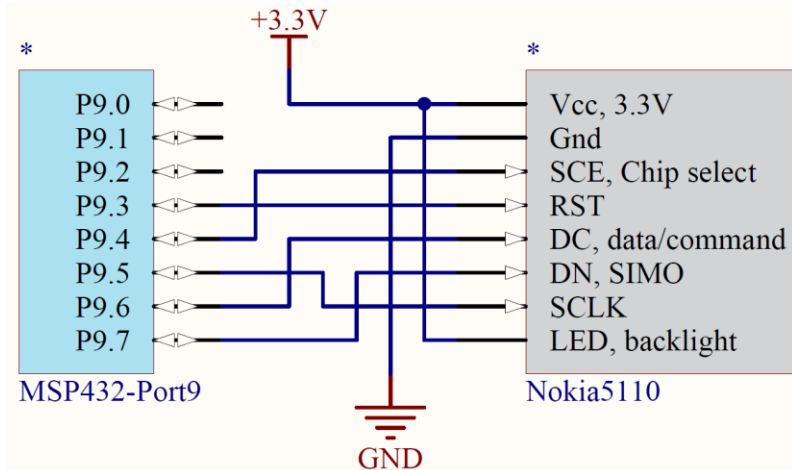
Assume the SPI clock is 12 MHz. In the Nokia5110.c software driver, there is an array that contains one 84 by 48 LCD image ($48 \times 84 = 4,032$)

```
#define SCREENW 84
#define SCREENH 48
uint8_t Screen[SCREENW*SCREENH/8];
```

The function **Nokia5110_DisplayBuffer** sends this entire buffer to the LCD. Approximately how long does this function take to execute?

4 Fundamentals of SPI

Consider the MSP432 to Nokia5110 interface from lab.



Assume the SPI clock is 12 MHz. Make a rough sketch of the waveforms created as one data byte (value=0x12) is transmitted from MSP432 to LCD. RST will be high and DC will be high. Show the remaining 3 signals

```
SCE = P9.4 STE
DN/SIMO = P9.7 SIMO
SCLK = P9.5 CLK
// bit15 UCCKPH = 1; data shifts in on first edge, out on following edge
// bit14 UCCKPL = 0; clock is low when inactive
```

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