

ELEC 327 Lab05

video link: http://youtu.be/ri6BcvCVt_I

1. What are the two categories that all forms of serial communication can be divided into?

In which category is the APA102?

Synchronous and asynchronous. APA102 is synchronous.

2. What are two major differences between SPI and I2C serial communications? Which would be best for controlling a large string of LEDs?

The protocols are different. SPI is serial peripheral protocol, while I2C is inter-integrated protocol.

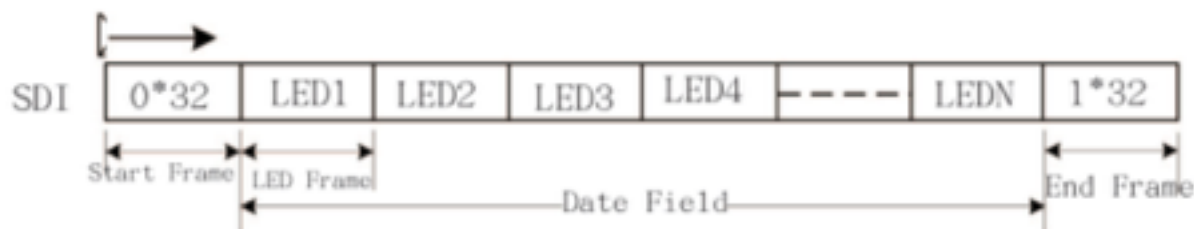
I2C has lines (SDA and SCL); SPI has 3+ slave lines.

SPI is a single master, multi slave architecture, while I2C is multi master, multiple slaves architecture.

For large string of LEDs, we might need multiple hardwares to drive the LEDs, meaning more than a single master. Therefore, I2C is better for this application.

3. The APA102 uses a modified form of SPI to enable control of multiple LEDs without needing a separate "chip select" line for each one. Briefly describe how it does this.

Use a cascading data structure. A single SDI is outputted, and in that bit stream, different 32 bit blocks are controlling different LEDs. See the following graph for reference.



4. How big (in bytes) is the SPI message required to set the color of a single APA102? How big (in bytes) is the SPI message required to set the color of each LED in a chain of 4 devices?

12 bytes (start frame + LED frame + end frame) are required to set a single APA102. For 4 devices, 24 bytes (start frame + 4*LED frame + end frame) are required.

5. How many USCI blocks does the g2553 device have? What three protocols can be controlled by the USCI?

4 blocks: USCI_A0, USCI_B0.

Protocols that can be controlled: UART, SPI, I2C.

6. On your launchpad, one of the serial modules is used to make a UART connection with the host computer (via USB). Which pins and which USCI module are used for this?

USCI_A0 is used for UART mode. The two pins used for this are UCA0RXD and UCA0TXD, which correspond to P1.1 and P1.2, respectively.

7. Which pins can be used for the SPI clock and master-out-slave-in (MOSI) data?

UCA0SIMO is used for MOSI data, which correspond to P1.2. UCA0CLK is used for SPI clock, which correspond to P1.4. Using UCB0 module, pin 1.5 is used for clock, and pin 1.7 is used for MOSI data.