Sam Wimmer

Lab 5 I^2C Interface

Pre Lab-Questions:

1. Describe two differences between I2C master and slave devices?

- The master can initiate communication while the slave cannot.

- The master can pick which slave to communicate with but a slave can only respond.

2. What are the two connections in an I2C bus? Describe their purpose.

- SDA is Serial Data which is used for producing and sharing data depending on the direction of communication.

- SCL is Serial Clock which has clock transitions from the master device. The slave device will use this signal to both receive and transmit data. The slave can also pause this line if processing time is needed.

3. What is the difference between open-drain and push-pull outputs?

- Push pull outputs have drive transistors that allow the system to either pull the connection high or pull it low to source or sink the current depending on the external voltage. An open drain system only has one transistor that can pull the output low and to get pulled to a high state there is a pull up resistor.

4. What is the purpose of the I2C restart condition?

- The purpose of a restart condition is to switch the master from reading to writing or vice versa without a full stop condition which would possibly lose control to other slaves or masters.

5. What peripheral register would you use to set the read/write direction of the next I2C transaction?

- The RD_WRN control register.

6. The 10-bit SADD bit-field holds the slave device address. Since standard I2C addresses only

use 7 bits, to which bits in the bit-field would you write the shorter address?

- The default 7 bit addressing uses bits [7:1].

7. Name one thing you found confusing or unclear in the lab.

- I had a hard time trying to understand how a restart condition is shown or done without both of the connections going high causing a stop condition.

Post Lab Questions:

1. What does the AUTOEND bit in the CR2 register do? Why don't you want to use it when you'll be needing a restart condition?
-When enabled it sends an automatic stop condition once all the bytes have been sent. We don't want to use this when we are needing a restart condition while reading because then it will give up the i2c bus to be used by another master instead of keeping the bus to read.
2. This lab used standard-mode 100 kHz I2C speed. What values would you write in the TIMINGR if we were using 400 kHz fast-mode?
-Presc = 0, SCLL = 0x9, sclh = 0x3, sdadel = 0x1, scldel = 0x3
3. This lab used blocking code. To implement it completely as non-blocking you would replace all of the wait loops with interrupts. Most flags in the I2C peripheral can trigger an interrupt if the proper enable bit is set. Find the interrupt enable bits that match the following flags:
• TC – bit 6
• NACKF – bit 4
• TXIS (transmit interrupt) – bit 1
• ARLO – bit 9
4. The gyro can operate in three full-scale/measurement ranges, measured in degrees-per-second (dps). What are these three ranges?
- The three ranges are 245, 500, and 2000 DPS.
5. What is the I2C address of the gyro when the SDO pin is low? The lab has the pin set high, read the I2C section of the gyro datasheet.

-When the SDO pin is low it is "1101000" which is 0x68.