

EE 308 – Homework 9

Due Mar. 28, 2012

For all problems below assume you are using a MCS12DP256 chip with a 24 MHz bus clock and a 8 MHz oscillator clock.

1. Write some code which will enable the ATD1 A/D converter, put it into 10-bit right-justified mode, and convert the analog inputs on pins PAD12 through PAD15 continuously.
2. Write some code which will enable the A/D converter ATD1, put it into 8-bit right-justified mode, and convert the analog inputs on pins PAD12 through PAD15 once. Add some code which will wait until the four conversions are completed.
3. Write some code which will enable the A/D converter ATD1, put it into 10-bit right-justified mode, and convert the analog input on pin PAD11 eight times, then stop. Add some code which will wait until the eight conversions are completed.
4. Add some code to the above problem which will average the eight values of the conversions of PAD11.
5. The ADXL325 is a MEMS 3-axis accelerometer from Analog Devices. It puts out three analog voltages which are linear functions of the accelerations along the three axes X , Y and Z . When connected to a 3 V power supply, the sensor puts out 1.5 V for an acceleration of 0 g, and has a slope of about 174 mV/g. The three outputs are connected to three A/D inputs of an MC9S12. The MC9S12 ATD is running in 10 bit mode. VRL is connected to 1 V, and VRH is connected to +2 V.
 - (a) What is the smallest acceleration change which can be measured?
 - (b) What is the acceleration when the A/D output is 0x007C?
 - (c) An ADXL325 is connected to a printed circuit board in an orientation such that, when sitting flat, the acceleration along the X and Y axes are 0, and the acceleration along the Z axis is 1g. What will the digital outputs of the A/D converters be?
 - (d) The outputs of the the three A/D converts are: 0x200 for the X axis, 0x1D2 for the Y axis, and 0x2AC for the Z axis. What is the orientation of the PC board?
6. Assume an ADXL325 is connected is connected to A/D ports PAD9, PAD10 and PAD11. Write a program to read the voltage from these three pins, and convert them to accelerations.
7. Suppose that the 7-bit address of an I²C slave is B'1001011. What is the 8-bit hex value you need to use to write data to this slave? What is the 8-bit hex value you need to use to read data from this slave?
8. Assuming that the MC9S12 is running with a 24-MHz bus clock, compute the values to be written into the IBFD register to set the baud rate up to 100 kHz. Use Table 3.4 of the MC9S12 IIC Block Guide. Repeat for a baud rate of up to 200 kHz.
9. The MAX5381 is a DAC with 8-bit resolution and an I²C interface which can output an analog voltage from 0 to +4V. The MAX5381 datasheet can be downloaded from the website <http://www.maxim-ic.com>.

- (a) What is the 7-bit address of the MAX5381MEUK?
- (b) What is the highest operating frequency of this chip?
- (c) What sequence of bytes would you write to this chip to set the output voltage to 3.2 V?