Exercises

# Digital to Analog Converter

1. Consider a 12-bit DAC with a reference voltage of 3.3 V. What input code will result in an output of 1.43 V?

Bits = 12, Vref = 3.3 V, Vout = 1.43

1. Consider a 10-bit DAC with a reference voltage of 2.7 V. Given that the input code is 0x104, what is the output voltage?

Bits = 12, Vref = 2.7 V, Code = 0x104 = 260

1. What is the output voltage resolution of an 8-bit DAC with a reference voltage of 3.0 V?

Bits = 8, Vref = 3.0 V

# Analog to Digital Converter

1. Consider a 12-bit ADC with a reference voltage of 3.3 V operating in single-ended mode. Given an input voltage of 0.92 V, what will the output code be?

Bits = 12, Vref = 3.3 V, Vin = 0.92 V

1. Consider an 8-bit ADC with a reference voltage of 2.7 V operating in single-ended mode. What input voltage range will lead to an output code of 0x34?

Bits = 8, Vref = 2.7 V, Code = 0x34 = 52

1. Consider a 12-bit ADC with an unknown reference voltage operating in single-ended mode. What is the reference voltage if sampling the 1.0V band gap reference results in a code of 0x513?

Bits = 12, Vout = 1.0 V, Code = 0x513 = 1299

1. Consider a 12-bit ADC with a reference voltage of 3.3 V operating in single-ended mode. If a temperature sensor and reads a voltage of 0.821 V, what is the temperature? Assume VTemp25=719 mV and the temperature coefficient (m) = 10 mV/°C.
2. How would you set up and read a sample from the ADC on your board? List the masks that need to be set in each of the relevant registers.

To set up the ADC targeting P2\_7:

Clock the module by setting up a divider, then select the divider with CLK\_SELECT07. The maximum clock speed for the SAR ADC is 18 MHz.

Route P2\_7 to V+ of the ADC by setting bit 6 on SAR\_MUX\_SWITCH0.

Include the channel to the ADC scan by setting bit 6 in SAR\_CHAN\_EN.

In SAR\_CTRL, set Vref to VDDA/2 with V- = Vref.

Enable the ADC in SAR\_CTRL.

To read:

Set a software start trigger in SAR\_START\_CTRL.

Wait for the SAR result to be valid by polling channel 7 in SAR\_CHAN\_RESULT\_VALID.

Read the ADC result from SAR\_CHAN\_RESULT07.