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 PA1:

1.Enable the clock for ADC module and GPIO Port A

RCC->AHB1ENR|=RCC\_AHB1ENR\_GPIOAEN;

RCC->APB2ENR|=RCC\_APB2ENR\_ADC1EN;

2.Configure the Port A pin 1 to be the Analogue Mode

GPIOA->MODER|=GPIO\_MODER\_MODER1;

GPIOA->PUPDR&=~(GPIO\_PUPDR\_PUPDR1);

3.Set the clock and ADC prescaler

RCC->CFGR|=RCC\_CFGR\_PPRE2\_DIV2;

ADC->CCR|=ADC\_CCR\_ADCPRE\_0;

4.Power up the ADC module

ADC1->CR2|=ADC\_CR2\_ADON;

5. Change to higher cycles to achieve a better accuracy if you wish

ADC1->SMPR2|=ADC\_SMPR2\_SMP1;

6. Select channel 1 as input

MODIFY\_REG(ADC1->SQR3, ADC\_SQR3\_SQ1, ADC\_SQR3\_SQ1\_0);

To read:

1. Use Software to trigger the conversion

ADC1->CR2|=ADC\_CR2\_SWSTART;

2. Wait for the completion of the conversion

while(!(ADC1->SR&(1UL<<1))){}

3. Return the reading value

return (ADC1->DR)\*3;