

Reading the Microchip TC1047A Temperature sensor.

General

This example project shows how to read the TC1047A analog temperature sensor and convert the Sensor output voltage to a temperature value.

The Sensor output voltage V_{out} is connected to the AN10 (RB10) of the dsPIC30F6014A located on the dsPIC PRO 4 development board.

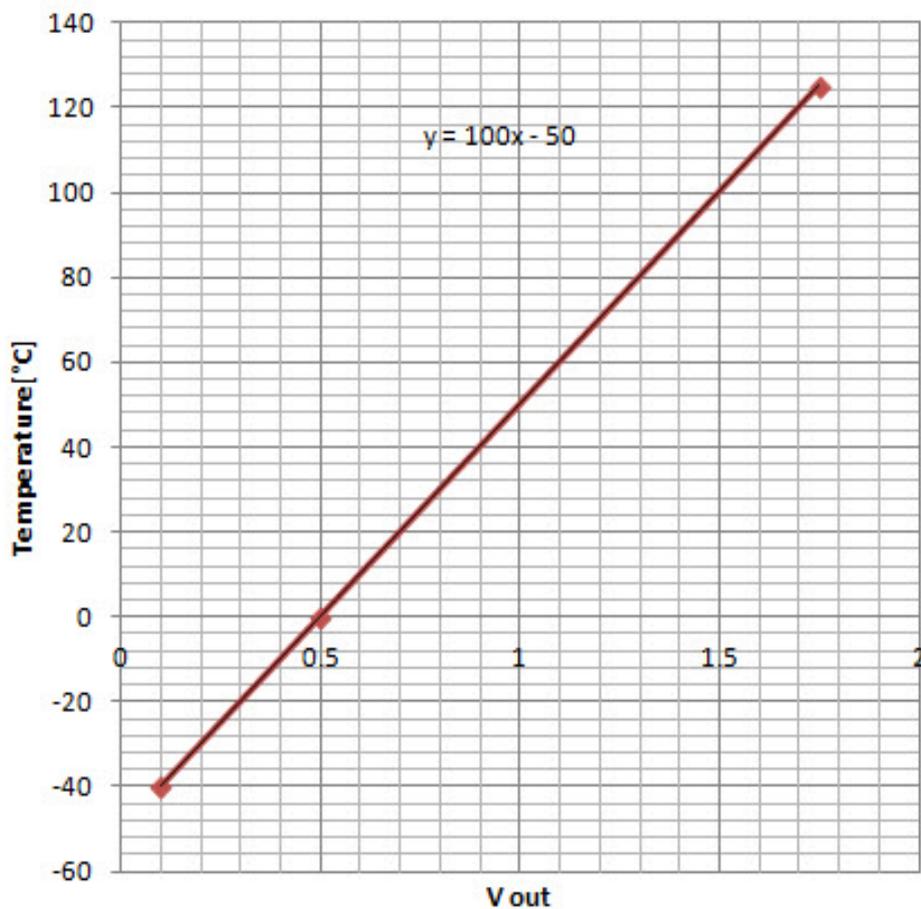
TC1047A Temperature sensor:

The Sensor outputs a voltage corresponding to the actual temperature, as the graph below shows. We use the AD Module of the microcontroller to detect the voltage and then we convert the voltage to a temperature value in the firmware.

The output voltage follows the standard linear equation rule.

$$y = mx + c$$

The following graph shows this linear relation Temperature vs. Sensor output voltage



From the graph we can get the temperature from the voltage

$$T_{\circ C} = 100 \cdot V_{out} - 50$$

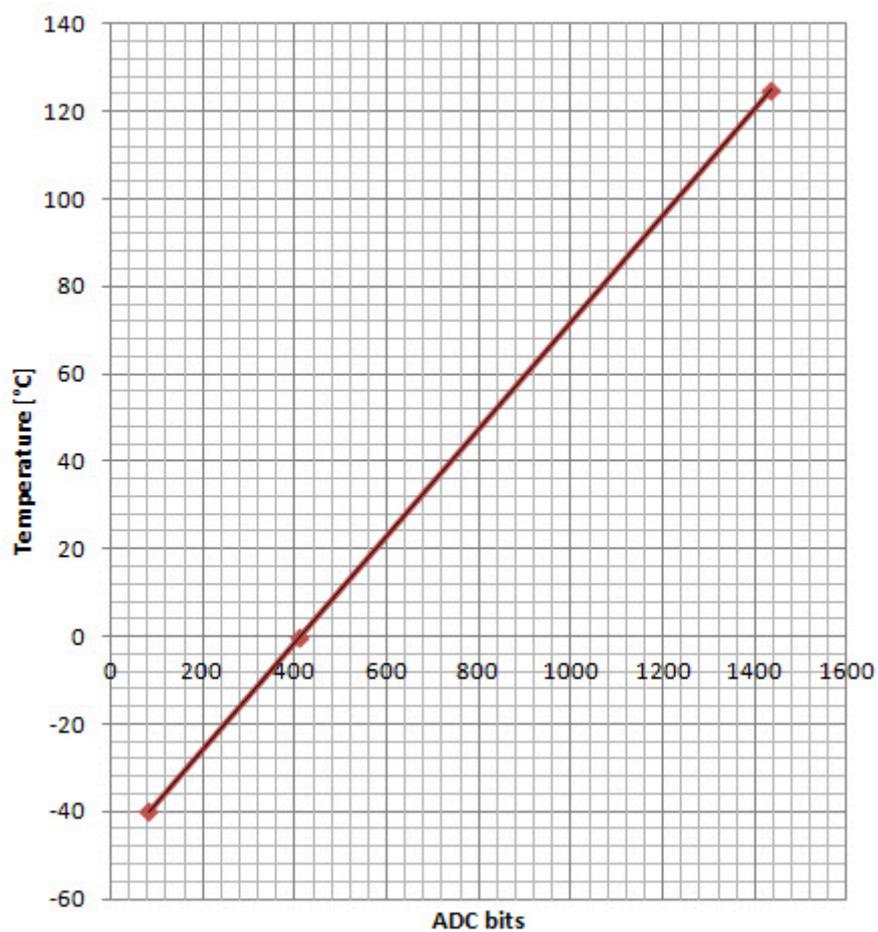
We could also use the resolution specified in the data sheet which would give the following

$$T_{\circ C} = \frac{V_{out}}{0.010} - 50 \quad [10\text{mV}/^{\circ}\text{C}]$$

When we change the voltage value to the ADC bit value we can perform the linear equation directly as ADC value versus Temperature saving us to first calculate the voltage from the ADC bit value and then calculate the temperature (as the ADC return a ADC bit value not the voltage directly)

In the example I use an integer value this the temp is shown in whole values no decimal value however the user can change to float type variable for the temperature and the decimals

The graph below shows the ADC bit relation to temperature



$$T_{\circ C} = 0.122 \cdot \text{bit value} - 50$$

In the code it is done as follows (based on a 12 bit ADC (0 - 4096))

```
Temp = (char) (LinearFactor * adcRaw) - offset
```

```
LinearFactor = 0.122
```

```
offset = 50
```

Basic Application Circuit with Low pass filter for TC1047A

