Interfacing Temperature Sensor

Introduction

- A thermistor responds to temperature change by changing resistance, but its response is not linear
- The complexity associated with writing software for such nonlinear devices has led many manufacturers to market the linear temperature sensor

Temperature (C)	Tf (K ohms)
0	29.490
25	10.000
50	3.893
75	1.700
100	0.817

From William Kleitz, digital Electronics

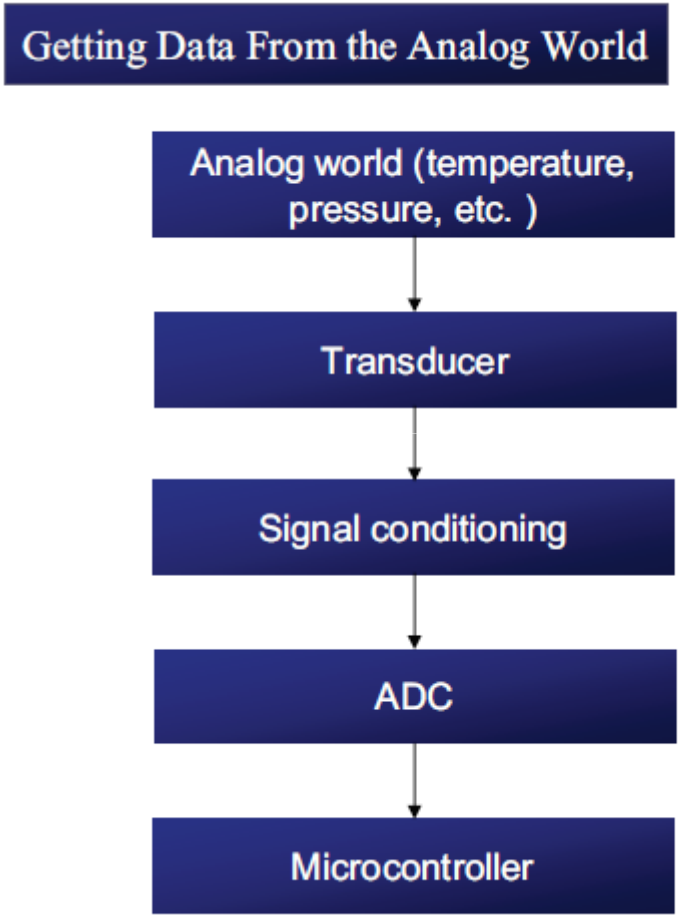
LM34 and LM35 Temperature Sensors

- The sensors of the LM34/LM35 series are precision integrated-circuit temperature sensors whose output voltage is linearly proportional to the Fahrenheit/Celsius temperature
  - The LM34/LM35 requires no external calibration since it is inherently calibrated
  - It outputs 10 mV for each degree of Fahrenheit/Celsius temperature

Signal Conditioning and Interfacing LM35

- Signal conditioning is a widely used term in the world of data acquisition
  - It is the conversion of the signals (voltage, current, charge, capacitance, and resistance) produced by transducers to voltage, which is sent to the input of an A-to- D converter
- Signal conditioning can be a current-to voltage conversion or a signal amplification
  - The thermistor changes resistance with temperature, while the change of resistance must be translated into voltage in order to be of any use to an ADC

Signal Conditioning and Interfacing LM35



Signal Conditioning and Interfacing LM35

Example:

Look at the case of connecting an LM35 to an ADC804. Since the ADC804 has 8-bit resolution with a maximum of 256 steps and the LM35 (or LM34) produces 10 mV for every degree of temperature change, we can condition Vin of the ADC804 to produce a Vout of 2560 mV full-scale output. Therefore, in order to produce the full-scale Vout of 2.56 V for the ADC804, We need to set Vref/2 = 1.28. This makes Vout of the ADC804 correspond directly to the temperature as monitored by the LM35.

Temperature vs. Vout of the ADC804

Temp. (C)	Vin (mV)	Vout (D7 – D0)
0	0	0000 0000
1	10	0000 0001
2	20	0000 0010
3	30	0000 0011
10	100	0000 1010
30	300	0001 1110

Signal Conditioning and Interfacing LM35