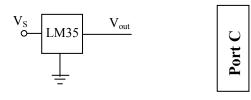
## **ADC** and Input Range Example

Given: LM 35 Temperature sensor

- 10 mV/°C
- 0-100°C desired measurement range
- a). What is the smallest temperature change you could resolve if the output from the LM 35 is connected directly to one of the Port C pins on the ATmega328? (What is the LSB?)



b). What would you do to maximize the resolution of temperature measurement in this situation? What is the best resolution you could obtain with the ATmega328 in this measurement example?

COMPLETE IRQ 8-BIT DATA BUS ADF ADIE ADC DATA REGISTER ADC MULTIPLEXER SELECT (ADMUX) ADC CTRL. & STATUS REGISTER (ADCSRA (ADCH/ADCL) REFS0 MUX2 MUXO REFS1 ADLAR MUX1 ADFR ADSC MUX DECODER PRESCALER CHANNEL SELECTION CONVERSION LOGIC AVCC INTERNAL 1.1V REFERENCE SAMPLE & HOLD COMPARATOR AREF 10-BIT DAC remperature SENSOR BANDGAP REFERENCE ADC7 ADC MULTIPLEXER INPUT MUX OUTPUT Notes: ADC5 AVCC is the supply voltage pin for the A/D Converter. It should be ADC4 externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. On the STK500 and the ADC3 Arduino, VCC is connected to AVCC for you. ADC2 AREF is the analog reference pin for the A/D Converter. It sets the top of the voltage range that will be converted. ADC: If you connect an external voltage reference to AREF, you may only use the ADC0 AREF voltage reference selection (REFS1 and REFS0 bits both zero in ADMUX register), so that you don't short to AVCC.

ADC CONVERSION

Figure 23-1. Analog to Digital Converter Block Schematic Operation,

Source: ATmega328 Data Sheet, p. 252

Figure 22-1. Analog Comparator Block Diagram<sup>(2)</sup>

