

## Precision Temperature Measurement Using a TC1046/1047 Sensor and a PIC16F872 MCU

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This Technical Brief gives a description of interfacing a TC1046 temperature sensor to a PIC16F872 microcontroller. A 2 x 20 dot matrix LCD is included in the design to provide additional functionality.

### THEORY OF OPERATION

The Microchip TC1046 is a linear output temperature sensor with an output voltage that is proportional to the temperature of its environment. The TC1046 has a temperature range of  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  ( $\pm 2^{\circ}\text{C}$ ), equivalent to 165 steps of  $1^{\circ}\text{C}$  at 6.25 mV per step. The output voltage ranges from 174 mV ( $-40^{\circ}\text{C}$ ) to 1205 mV ( $125^{\circ}\text{C}$ ). There is no need for a negative pull-down voltage for temperatures below  $0^{\circ}$ .

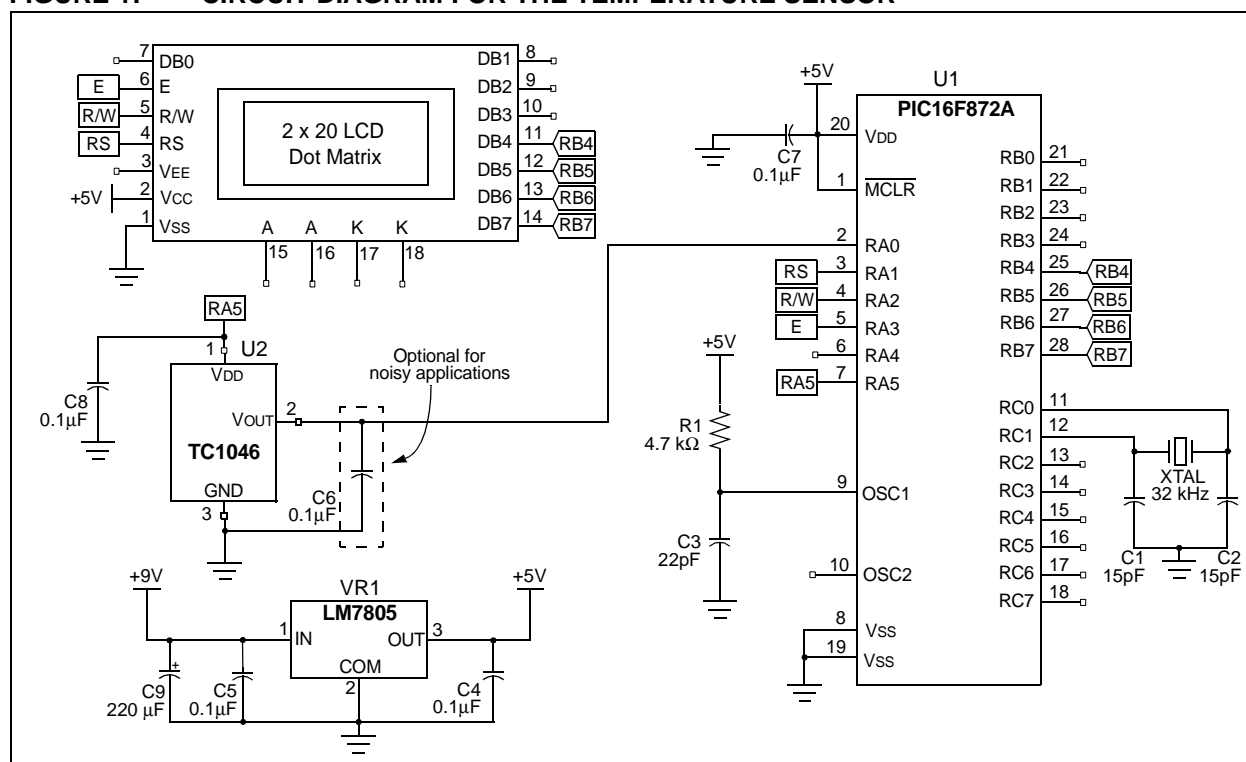
Microchip also offers the TC1047 temperature sensor. This is identical in range and operation to the TC1046, with two major differences:

- The voltage steps are 10 mV/ $^{\circ}\text{C}$
- The voltage range is 100 mV to 1750 mV

Both devices are available only in SOT-23B packages.

A sample schematic for the application is shown in Figure 1. The microcontroller's speed is determined by an RC oscillator with a frequency of approximately 2.7 MHz. Timer1 is configured as a real-time clock which establishes the temperature measurement interval. Between measurements, the sensor is turned off to conserve battery power. The microcontroller provides power to the sensor via I/O pin RA5, and samples the output voltage using the A/D converter via pin AN0. The LCD displays the current temperature, as well as the maximum and minimum temperature for the previous 24 hour period.

**FIGURE 1: CIRCUIT DIAGRAM FOR THE TEMPERATURE SENSOR**



# TB051

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NOTES:

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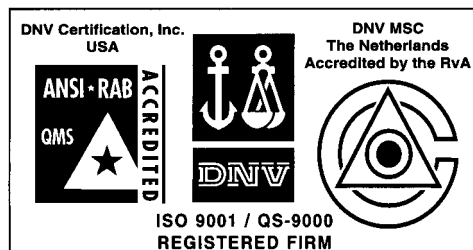
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