

APPLICATION NOTE 4531

Reference Design for a PC-based Temperature-Measurement System

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Abstract: This application note is a reference design for a PC-based temperature measurement system. It uses the MAX1396 and MAX6603EVKITS, a MAXQ2000 microcontroller, and MAX6603 signal conditioner. The design presents an easy way to obtain the temperature readings from the MAX6603 without requiring complicated conversion formulas. Schematics, block diagrams, and software are all provided.

Introduction

This reference design describes how to create a PC-based temperature-measurement system for evaluating the [MAX6603](#) signal conditioner. The design uses two EV (evaluation) kits, the [MAX1396EVKIT](#) and a [MAX6603EVKIT](#), and an easy to use software [program](#).

The MAX6603 converts ambient temperature to a voltage signal by using two platinum thermistors. The MAX1396EVKIT provides the analog-to-digital conversion to measure the output voltage signal from the MAX6603EVKIT. Then the MAX1396EVKIT sends that signal to the PC. The software converts the received data to temperature values which are displayed on the screen.

Setup Overview

MAX6603

The MAX6603 is a dual-channel, platinum, RTD-to-voltage signal conditioner. It excites and amplifies the signal from two series-connected on-board 100 Ω platinum resistive temperature devices (Pt RTD) to achieve high-voltage, level-filtered signals for temperature measurements. This reference design uses the MAX6603EVKIT to measure the temperature. The Pt-RTDs mounted on the EV kit board can be electrically disconnected from the circuit by removing the shunt on JU4 and allowing an external Pt-RTD to be connected to the MAX6603 through twisted-pair cabling.

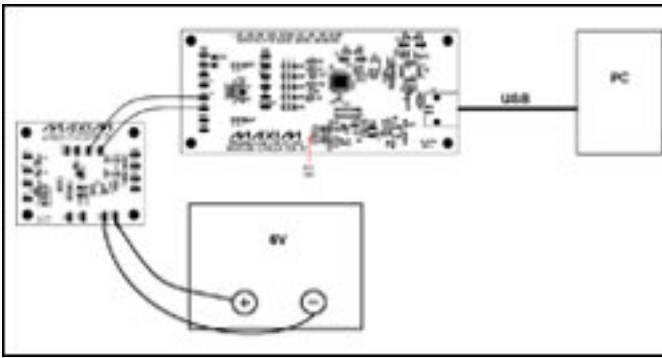
MAX1396

The MAX1396 is a 312.5ksps, 2-channel single-ended, 12-bit SAR ADC. It is used in this design to measure the output voltage from the MAX6603EVKIT. Please follow the instructions in the MAX1396EVKIT data sheet to install the EV kit.

Hardware

Apply a +6V to +9V voltage supply to the HVIN pad of the MAX6603EVKIT, and connect the negative terminal of the voltage supply to the GND pad. The OUT1 and GND pads of the MAX6603EVKIT need to be connected to the AIN1 and the GND pads of the MAX1396EVKIT. Use a USB cable to connect the MAX1396EVKIT to the PC.

Figure 1 shows the hardware system setup.



[More detailed image](#) (PDF, 416kB)

Figure 1. Hardware system block diagram.

The MAX6603EVKIT consists of the MAX6603, all required passive components, and a proven PCB layout. The MAX6603EVKIT schematic is shown in **Figure 2** and **Table 1** shows the jumper settings.

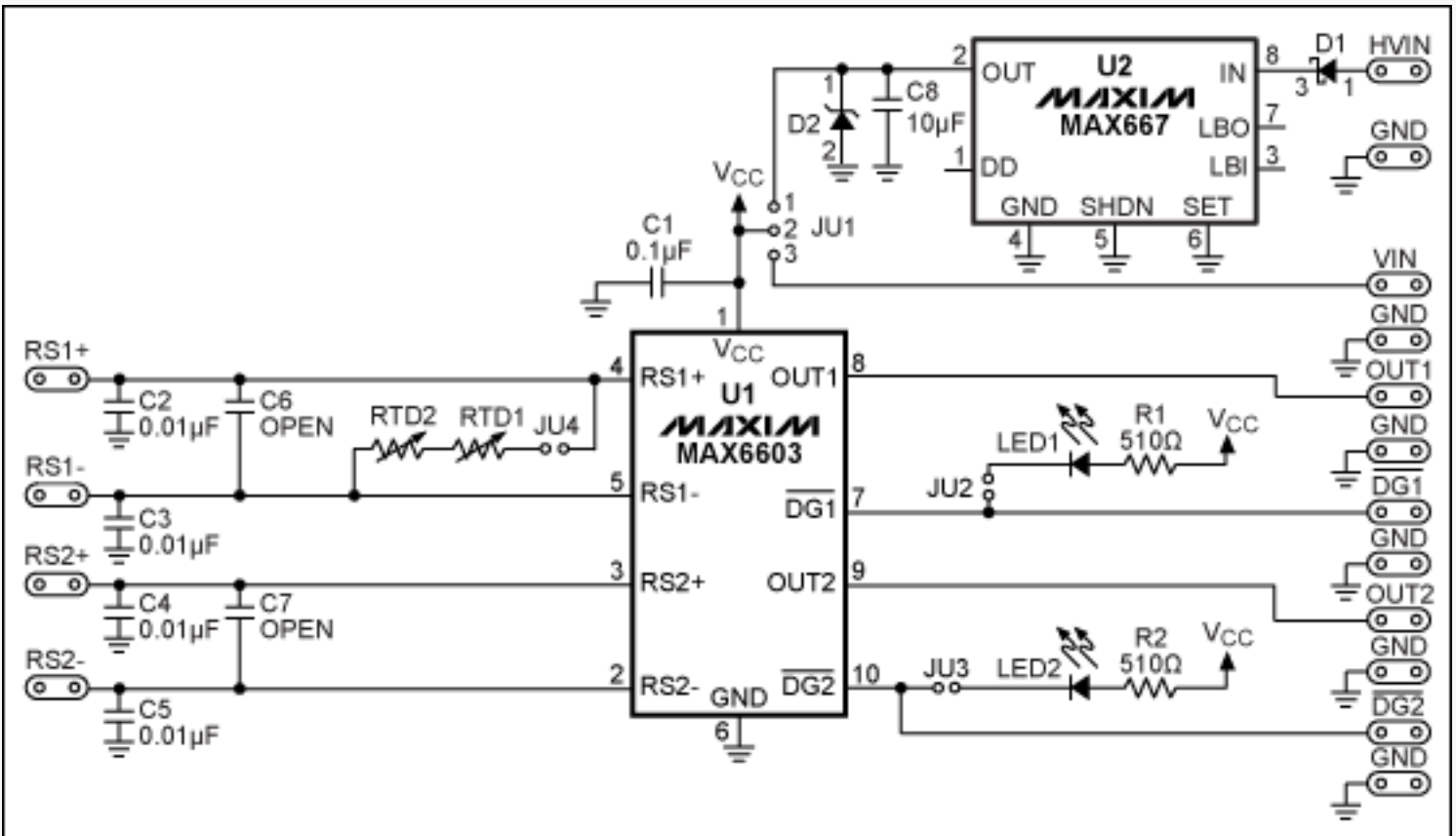
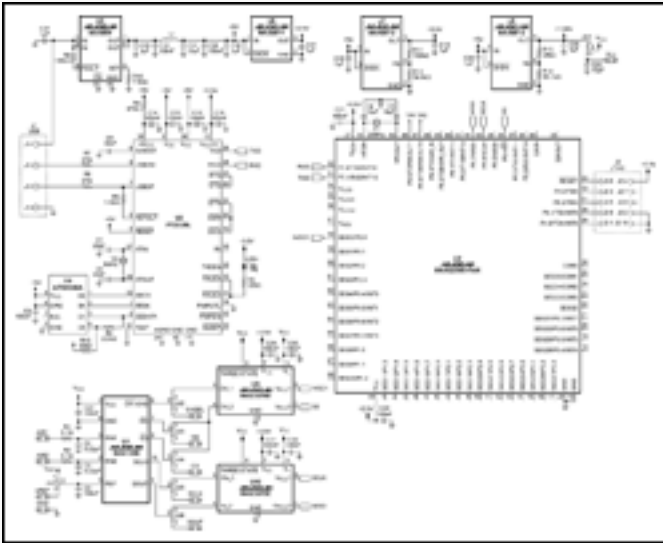


Figure 2. MAX6603EVKIT schematic.

Table 1. MAX6603EVKIT Jumper Settings

Jumper	Position
JU1	1-2
JU2	1-2
JU3	1-2
JU4	1-2

The MAX1396EVKIT consists of one MAX1396 device, one [MAXQ2000](#) microcontroller, all required passive components, and a proven PCB layout. The MAX1396EVKIT schematic is shown in **Figure 3** and **Table 2** shows the jumper settings.



[More detailed image](#) (PDF, 452kB)

Figure 3. MAX1396EVKIT schematic.

Table 2. MAX1396EVKIT Jumper Settings

Jumper	Position
JU1	1-2
JU2	1-2
JU3	1-2
JU4	1-2
JU5	1-2
JU6	1-2
JU7	1-2

Windows® Program Overview

This program (**Figure 4**) has an easy-to-use graphical user interface that is compatible with Windows 98SE/2000/XP. It displays the output voltage of the MAX6603EVKIT and the corresponding temperature readings from the platinum thermistors on the screen.

Once the MAX1396EVKIT is connected to the PC through the USB cable, the MAXQ2000 waits for the commands from the Windows program. Start the program and a window similar to Figure 4 should appear. If a message box says, "No Virtual COM Port Detected," close the program, reconnect the USB cable, and restart the program.

After the software starts up, by default the **Auto Read** box is checked. The software continuously sends the **Read Temp** command to the MAX1396EVKIT to measure the OUT1 voltage of the MAX6603EVKIT. The temperature is read at a rate set by the **Time Interval** pulldown menu. After the software receives the measured OUT1 voltage value, the corresponding temperature value will be displayed in the upper left corner of the screen.

To have more accurate ADC readings, use a digital voltmeter to measure the reference voltage on pin 1 of JU7 on the MAX1396EVKIT. Enter the value into the **MAX1396EVKIT reference voltage** edit box. If this is done correctly, the ADC readings should have less than 0.1% error.

Measure the actual supply voltage on pin 1 of the JU1 on the MAX6603EVKIT, and enter the value into the **MAX6603 supply voltage** edit box. This step is important because the formula, which is used to convert the output voltage of the MAX6603 to temperature, depends on the value of the supply voltage.

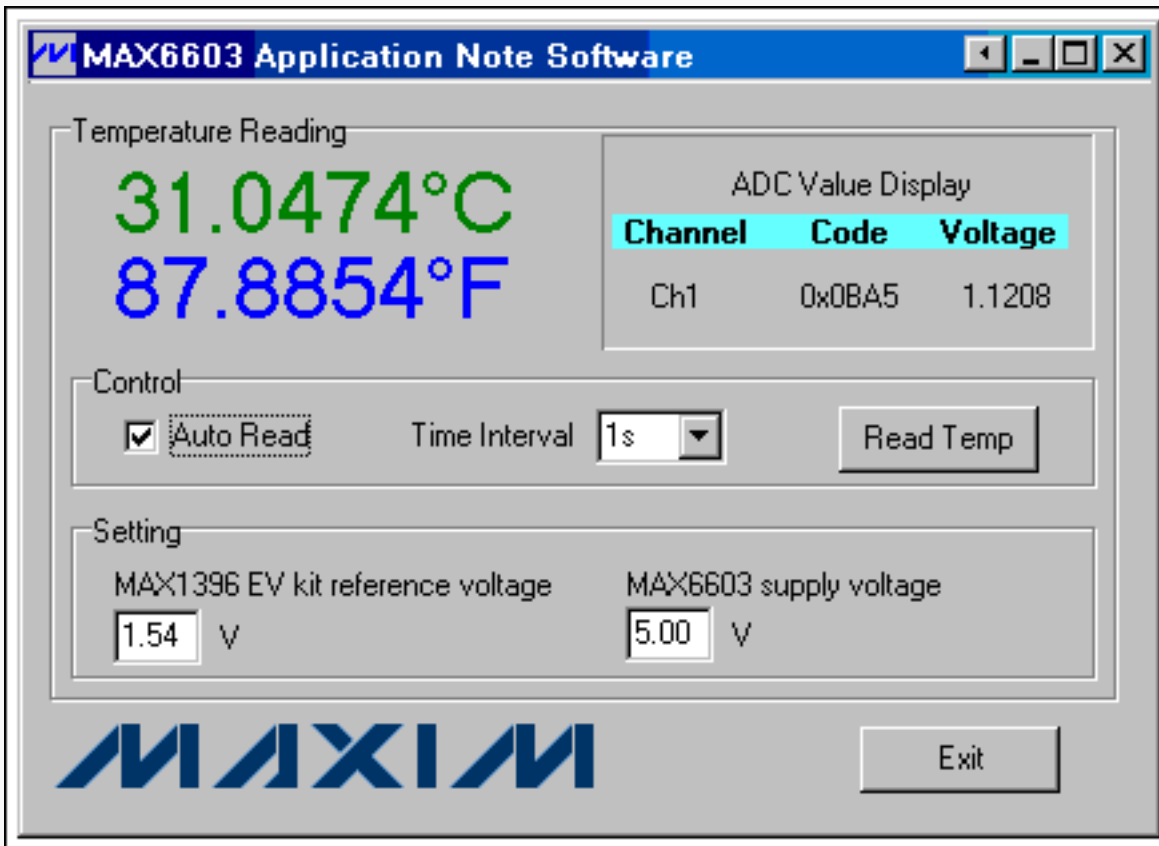


Figure 4. The reference design's software measures the temperature from the EV kit and voltage from the MAX6603.

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Related Parts

MAX1396: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)

MAX6603: [QuickView](#) -- [Full \(PDF\) Data Sheet](#)

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