19-1265; Rev 1; 3/98

MAXIM

# MAX1617 Temperature Sensor Evaluation Kit

Evaluates: MAX1617

## General Description

The MAX1617 evaluation kit (EV kit) is a demonstration platform for the MAX1617 temperature-sensor IC. It monitors both the junction temperature of the IC and the temperature of a remote (external) diode-connected transistor, and converts these temperatures to 8-bit, 2-wire serial data. A 2N3904 remote temperature-sensor transistor comes soldered to the board in a SOT23 package, but for more realistic experiments, it can easily be removed and connected via a twisted pair to the DXP and DXN terminals.

The EV kit is designed to be connected to a standard IBM-compatible PC parallel printer port. Signals from the parallel port are converted to open-drain SMBus™ clock and data by a 74HC05 logic chip on the board. An on-board MAX883 linear regulator with reverse voltage protection steps down the unregulated DC input to 5V to power the glue logic, the MAX1617, and the SMBus pull-up resistors.

The software runs under Windows™ 3.1 or 95. This user-friendly program is menu-driven and offers a graphic user interface with control buttons and numeric data displays.

## Features

- ♦ **Measures and Displays Sensor Temperature**
- ♦ **Simultaneously Monitors Package and a Remote Sensor**
- ♦ **Programs Alarms, Configuration, and Rate**
- ♦ **Operating Temperature Ranges:**
  **-55°C to +125°C (remote sensor)**
  **0°C to +70°C (board)**
- ♦ **Easy to Use**
- ♦ **Includes: Windows 3.1/95 Software**
  **Demo PC Board**
  **3.5 in. Floppy Disk**

## Ordering Information

| PART | TEMP. RANGE | BOARD TYPE |
|---|---|---|
| MAX1617EVKIT-QSOP | 0°C to +70°C | Surface Mount |

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*SMBus is a trademark of Intel Corp.*

## Equipment Needed

- IBM-compatible PC, 386 at 20MHz or better
- Windows 3.1 or Windows 95
- Parallel printer cable, straight-through 25-pin male-to-female type
- DC power supply, 9V at 50mA

## Quick Start

1) Set up the hardware. Connect the parallel cable to the computer port and to the EV kit board (or else simply plug the board directly into the port without the cable). The parallel port is typically labeled LPT or PRINTER. Adjust the power supply to +9$V_{DC}$ and connect it to the POS9 and ground terminals on the EV kit. **Do not apply voltages higher than +11V.**
2) Install the software. The MAX1617.EXE software can be run from the floppy or from a hard drive. Simply use the Windows program manager to run the program. The program prompts you to select the correct parallel port. An auto-detect routine attempts to identify the correct port and highlights it as the default choice. Another auto-detect routine attempts to find the MAX1617 by cycling through the nine possible addresses.

After the parallel port and address are set up, the user interface panel appears. The MAX1617 is now operating in its default power-on-reset (POR) mode, auto-converting at a 0.25Hz rate. The display shows the current temperature for both remote and local channels.

## Detailed Description

### User-Interface Panel

The user interface is easy to operate; use the mouse, or press the Tab key to navigate with the arrow keys. Each of the buttons corresponds to bits in the command, conversion rate, and configuration bytes. Clicking on them generates the correct SMBus write operation to update the internal registers. The program continually polls the device for new temperature data and status, and alerts at a rate faster than the fastest conversion rate. To change the $T_{HIGH}$ and $T_{LOW}$ alarm-threshold comparison registers, select the appropriate data field and type in the new value. Pressing Enter after typing in the new values updates the internal registers.

To make single-shot conversions, click the Stop button under Configuration, and then click on the Measure Now button. Single-shot conversions can also be performed while the device is auto-converting. The single-shot command overrides the automatic conversion. After the single shot is complete, the device returns to automatic operation.

If an interrupt condition is generated, typically by the temperature crossing one of the alarm threshold levels, a message appears in the alert box: “ALERT! INT = LOW”. To clear the interrupt, first eliminate the condition that caused it (typically by resetting the alarm threshold) and then click on Read Alert. This action reads the Alert Response address, returns the value of the current MAX1617 slave address, and clears the interrupt.

### *Simple SMBus Commands*

There are two methods for communicating with the MAX1617: via the normal user-interface panel, or via the simple SMBus commands available from the SMBus pull-down menu. The menu lists simple SMBus protocols, such as Read Byte and Write Byte. To stop normal user-interface execution so that it does not override the manually set values, turn off the update timer that slaves the program to the conversion rate by clicking the Automatically Update Displays button.

Note that in places where the slave address asks for an 8-bit value, it must be the 7-bit slave address of the MAX1617 as determined by ADD0 and ADD1 with the last LSB bit always set to one.

### *Data Logging*

Data logging commands are accessed via the pull-down menu labeled “MAX1617”. Data logging saves temperature data for both channels to a text file that includes a time/date stamp next to each data point. At high conversion rates, not every data point is logged, depending on the speed of the disk drive where the file is being written. To stop data logging, select Logging from the pull-down menu.

### *Jumper and Switch Settings*

Two jumpers set the MAX1617 slave address. The default address is 0101 010 (ADD0 = ADD1 = high-Z); to get other settings, jumper JU1 and/or JU2 must be installed (Figure 1). JU1 responds to ADD0 and JU2 corresponds to ADD1; see Table 8 in the MAX1617 data sheet for a complete list of slave addresses. The MAX1617 must undergo a power-on reset for the new address to become effective.

A slide switch, SW1, is provided as a means to force a power-on reset of the MAX1617. This switch simply disables power to the device.

The $\overline{STBY}$ hardware standby control input is hard-wired to $V_{CC}$. In order to apply an external disabling signal to $\overline{STBY}$, the narrow PC board trace at JU3 must first be cut. Figure 2 is a component placement guide. Figures 3 and 4 are the PC board layout.

## Table 1. Troubleshooting Guide

| SYMPTOM | POSSIBLE PROBLEM | SOLUTION |
|---|---|---|
| No SMBus Hardware Detected message | Bad connections | Check the parallel cable. If it is a straight-through type, try a different cable or connect directly to the port with no cable. |
| | Power supply | Check the supply voltage setting for correct polarity. Use a DMM to check the voltage directly at the board. |
| Question marks displayed in status and temperature data fields | No MAX1617 connected | Check the connections to the device. The SMBus interface is working, but the MAX1617 is not. Check the position of the slide switch. |
| SMB Clock Stuck Low or SMB Data Stuck Low message | Short circuit | Use a DMM to monitor the SMBCLK and SMBDATA terminals. They may be accidentally shorted. |
| Both channels always read 0°C, or new limits are not accepted, or $\overline{ALERT}$ interrupts are not seen by the program. | Bad power supply | Check the +9V supply. The board may be parasitically deriving power from the parallel-port logic signals. |
| The supply voltage at $V_{CC}$ is too low (<4.5V) but is higher than 1V. | | |
| Remote diode always reads 0°C. | DXP and DXN are shorted together, or DXP is shorted to GND | Check remote diode connections. |
| Remote diode always reads +127°C. | DXP open | Check remote diode connections. |
| Remote diode reads a value that is too high. | Excess resistance | Check resistance in diode path. |
| | Excess capacitance | Check capacitance from DXP to DXN. |
| | Poor-quality diode | Use a good-quality, diode-connected, small-signal transistor. |

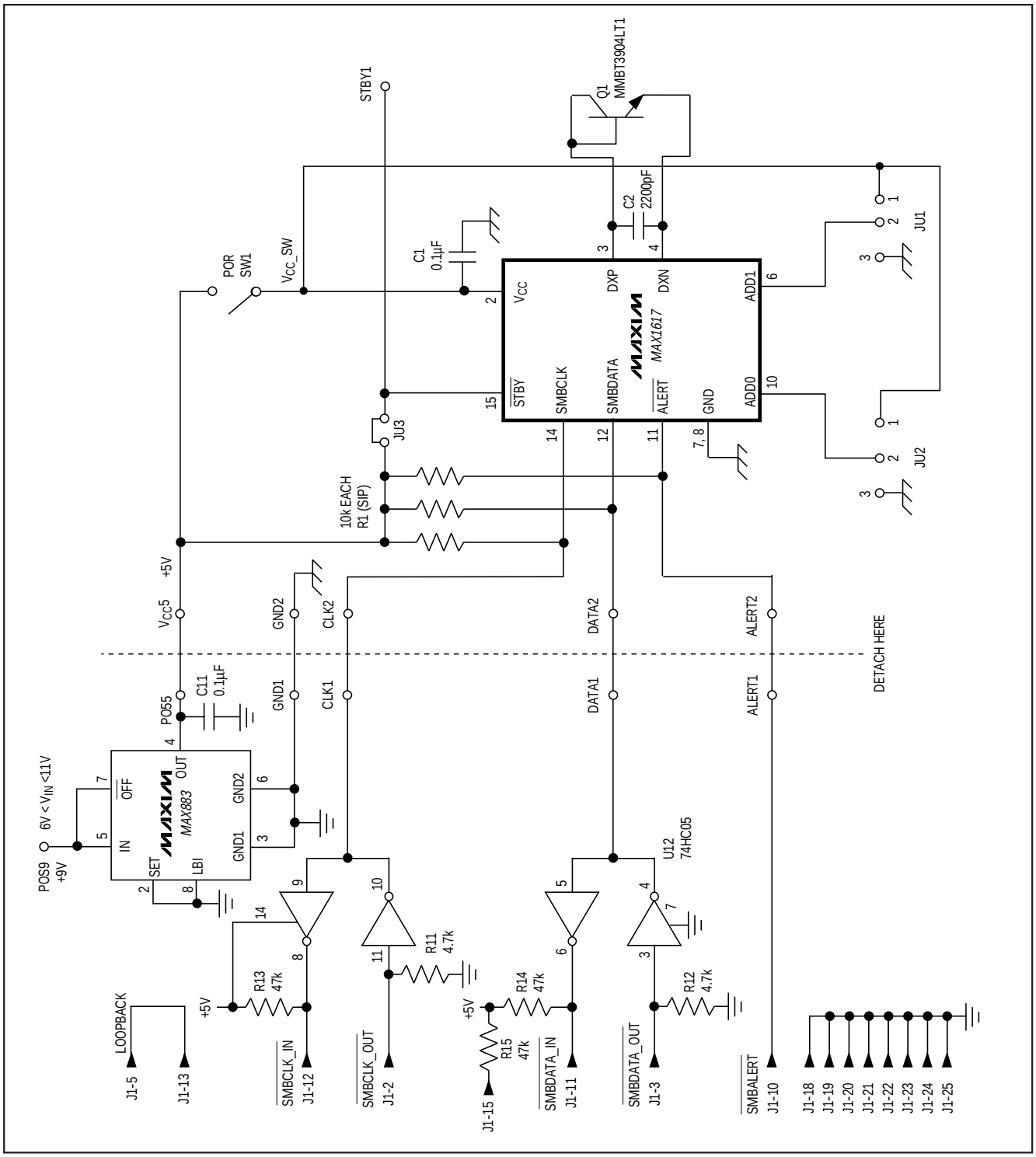


*Figure 1. MAX1617 EV Kit Schematic*

# MAX1617 Temperature Sensor Evaluation Kit

### Operating Temperature Range

The operating temperature range of this kit is 0°C to +70°C, although the MAX1617 itself is rated for -55°C to +125°C. The limitation is due to the maximum ratings of other components on the board, such as the connector and the logic chips. Specifications aside, the board can tolerate -55°C to +125°C temperatures. To facilitate testing the MAX1617 in a temperature chamber, cut the PC board along the dotted line and attach wires between the five terminals along the break. Thus, the MAX1617 can be heated or cooled without the parallel cable or interface in the chamber.

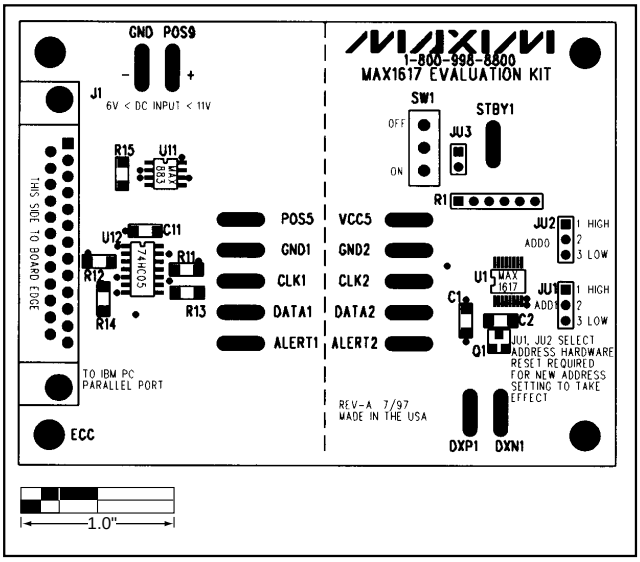


*Figure 2. MAX1617 EV Kit Component Placement Guide*

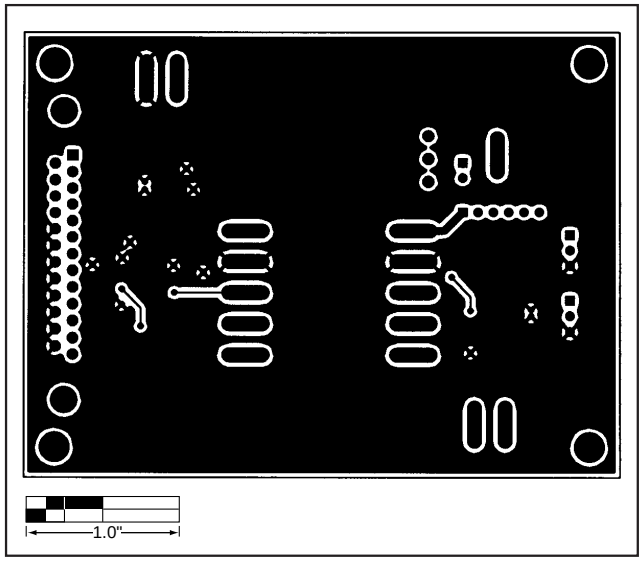


*Figure 4. MAX1617 EV Kit PC Board Layout—Solder Side*

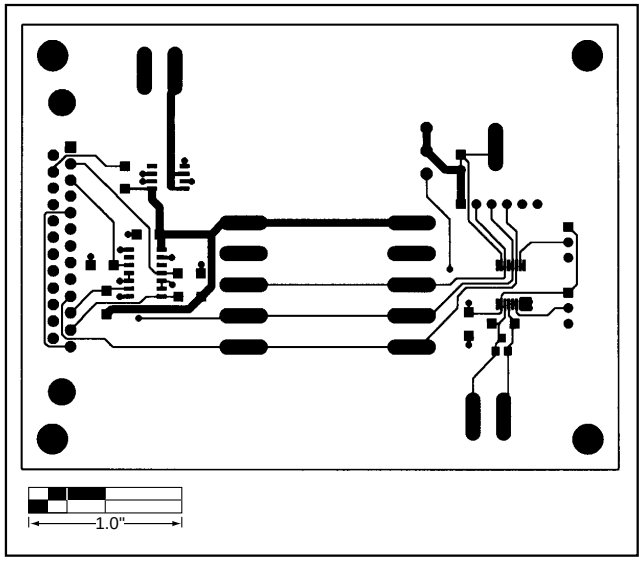


*Figure 3. MAX1617 EV Kit PC Board Layout—Component Side*