# MIC280 Evaluation Board

## DemoWare™ Software

## General Description

The Micrel MIC280 evaluation board and DemoWare™ software demonstrate the operation and features of the MIC280 Precision IttyBitty™ Thermal Supervisor. The MIC280 is a versatile digital thermal supervisor capable of measuring internal temperature and remote temperature. This manual describes how to use the evaluation board and the companion software.

### Getting Started

#### *What is Included*

Review the packing list in Table 1 to confirm that you received all listed items. If any of the items are missing or damaged, contact Micrel Semiconductor. The latest version of all Micrel data sheets may be obtained from our website at *www.micrel.com*.

| Item | Qty | Description |
|---|---|---|
| 1 | 1 | MIC280 Evaluation Board with Jumpers Installed |
| 2 | 1 | MIC280 Evaluation Board and DemoWare Software Manual (this document) |
| 3 | 1 | MIC280 Data Sheet |
| 4 | 2 | MIC280-0BM6 Samples |

**Table 1. Packing List**

### What You Must Provide

If the board is to be used with the MIC280 DemoWare, no additional items are required except for a suitable host PC. All power for the board will be drawn from the PC parallel port. The board may be plugged directly into the DB25 connector on the host PC. It may be more convenient, however, to use a cable between the PC and the board. A standard, straight-through, DB25 male-to-female cable may be used. The MIC280 DemoWare software may be downloaded from Micrel's website at *http://www.micrel.com*. Instructions for installing this software are included.

If a non-PC host is used, the following items are required for use with the MIC280 evaluation board:

- 3.3V, 100mA regulated power supply
- Power supply leads or cables
- SMBus™/I$^2$C™ compatible serial bus host for communication with the MIC280
- Cable for serial host connection, as appropriate

In either case, the following additional items are useful, but not required:

- Logic probe(s)
- Voltmeter(s)
- SMBus/I$^2$C bus analyzer
- Component cooling spray
- Heat gun

### General Description of the Evaluation Board

This board demonstrates use of the MIC280 Precision IttyBitty Thermal Supervisor. It is designed to support rapid prototyping of circuits employing the MIC280. A MMBT3906 transistor (surface mount equivalent to 2N3906) is included on the board in order to demonstrate the MIC280's ability to measure the temperature of a remote PN junction. A connector permits use of an external remote diode or transistor in place of the on-board remote transistor. User configurable jumpers select the remote sensor connections and the voltage source for powering the MIC280. An LED reports the status of the MIC280's interrupt request output when enabled.

For use with Micrel's DemoWare demonstration software, the MIC280 Evaluation Board may be connected directly to a PC parallel port via a DB25M connector. As an option, the user may install a four-pin ACCESS.bus™ type connector to interface the evaluation board with a serial bus host such as the IPort™ I$^2$C Host Adapter from MCC Corporation. An additional general-purpose 5-pin header can also be used to interface any I$^2$C/SMBus host to the board.

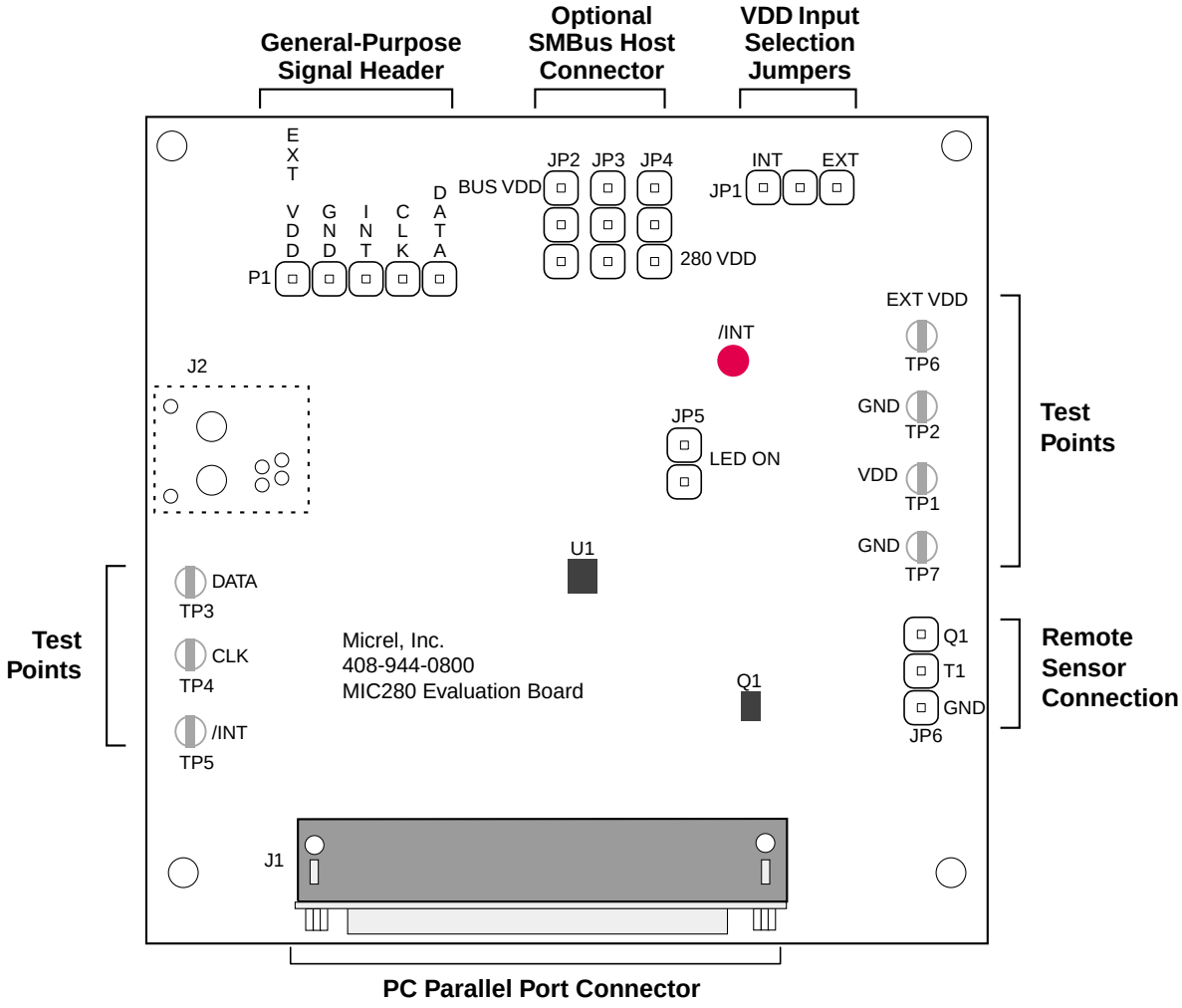



**Figure 1. MIC280 Evaluation Board**

### Powering the Board

The MIC280 evaluation board can be powered via the host PC's parallel printer port or an external power supply. Three options are available for powering the evaluation board.

**Option 1:** For use with Micrel's DemoWare demonstration software and a host PC, connect the board to the PC's parallel printer port via the DB-25M connector (refer to schematic in the *Hardware Reference* section). Pins 1 and 2 of JP1 should be shorted.

**Option 2:** The board can be powered by an external power supply via TP6 and TP7 test points. The positive connection should be made to TP6 and the ground connection should be made to TP7. Pins 2 and 3 of JP1 should be shorted.

**Option 3:** The board can be powered by a serial bus host such as the MCC IPort™ via an optional user-installed 4-pin Molex connector, J2. Pin 3 of this connector is assigned to carry the power supply voltage from the host. (See Figure 2) Pins 1 and 2 of JP1 should be shorted.

### Serial Bus Host Connector

The optional user-installed SMBus host connector is Molex part #15-83-0064 shown in Figure 2. This Molex connector is a 4-conductor shielded receptacle. The pinout of this connector is shown below. The mating connector is a Molex part #15-83-1564. See Appendix A for more information on these connectors. The serial bus signals are also present on single-row header P1 and at test points TP3 and TP4. One or more of these connection points can be used in lieu of the specialized connector. The various serial bus connection points are summarized in Table 2.

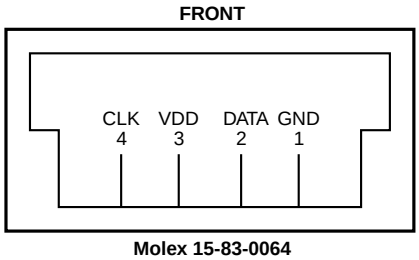



**Figure 2. Pinout of J2 Serial Bus Host Connector**

| Signal | Molex 15-83-0064 Pin # | P1 Pin # | TestPoint |
|---|---|---|---|
| Serial Data | 2 | 5 | TP3 |
| Serial Clock | 4 | 4 | TP4 |
| VDD | 3 | 1 | TP1 |
| GND | 1 | 2 | TP2 |
| /INT | N/A | 3 | TP5 |

**Table 2. Serial Bus Connection Points**

Personal computer based host adapters, cables, bus analyzers and other useful items can be obtained from the sources listed in Appendix A.

### Pull-Up Voltage for /INT, DATA and CLK

The DATA, CLK and /INT pins of MIC280 can be pulled up to either the SMBus voltage or to MIC280 $V_{DD}$ voltage. JP2, JP3 and JP4 are used for setting the pull-up voltage for /INT, DATA and CLK respectively. Table 3 summarizes the jumper selection required for setting the pull-up voltage. Some host adapters have internal pull-up resistors. Often these resistors can be switched on and off. Be sure to check the status of the host adapter's pull-ups, if any, before setting JP2/3/4.

| Voltage Level | /INT | DATA | CLK |
|---|---|---|---|
| (3.3V) MIC280 $V_{DD}$ voltage | 2-3 of JP2 Shorted | 2-3 of JP3 Shorted | 2-3 of JP4 Shorted |
| (3.3V to 5V) SMBus voltage | 1-2 of JP2 Shorted | 1-2 of JP3 Shorted | 1-2 of JP4 Shorted |

**Table 3. Pull-Up High Voltage for DATA, CLK and /INT Pins**

### Remote Diode Selection

The MIC280 can sense the temperature of a remote PN junction connected to the T1 pin. This PN junction is generally either a diode-connected bipolar junction transistor or the embedded thermal diode inside an integrated circuit such as a CPU. A diode-connected 2N3906-type transistor, Q1, is provided on the evaluation board. An off-board PN junction can be used for temperature measurement by connecting it to pin 2 and 3 of JP6. (Refer to Table 4.)

Figure 3 shows several examples of remote diode connections. To minimize noise pickup, connections to an off-board diode should be made using twisted-pair or shielded twisted-pair cable. Connections longer than a few inches or any connection in an electrically noisy environment should use shielded twisted-pair cable for optimal performance. (Note that the shield should be grounded only at JP6 on the evaluation board.) Suitable cable types include Belden's part number 8442 unshielded twisted-pair (UTP) and Belden's part number 8451 shielded twisted-pair (STP).

If using a transistor, the base and collector should be shorted together at the transistor. The emitter and base-collector terminals are then connected to JP6. The emitter is connected to pin 2 of JP6; the base-collector junction should be connected to pin 3 of JP6.

| Remote Diode Selection | Jumper Setting |
|---|---|
| On-Board Remote Diode Q1 | Short Pin 1 and 2 of JP6 |
| Off-Board Remote Diode | Connect the off-board diode to Pin 2 and 3 of JP6. |

**Table 4. Remote Diode Selection**

### Factory Settings

The MIC280-0BM6 is used for the evaluation board. Its slave address is $1001000_b = 48_h$. Remote on-board diode Q1 is used for remote temperature measurement. Pins 2 and 3 of JP2, JP3, and JP4 are shorted to pull DATA, CLK, and /INT up to the MIC280's $V_{DD}$ voltage.

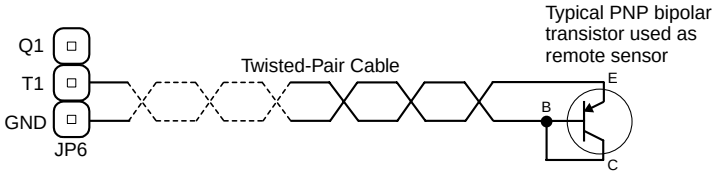



**Figure 3a. Remote Transistor Connection via JP6**

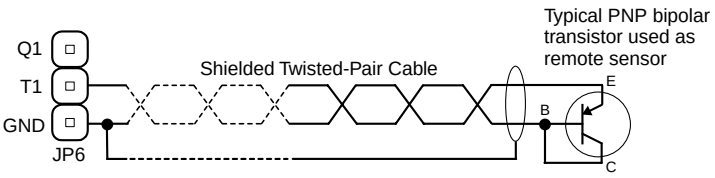



**Figure 3b. Remote Transistor Connection Using Twisted Pair Cable via JP6**

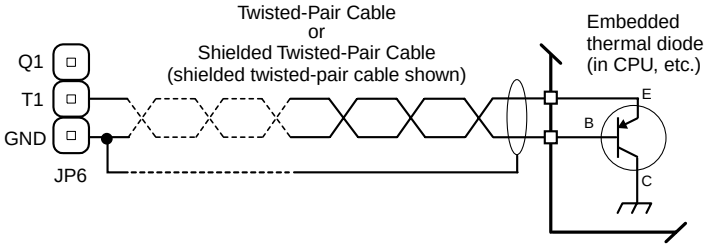



**Figure 3c. Embedded Thermal Diode Connection via JP6**

## Hardware Reference

**Terminals**

| Designator | Description |
|---|---|
| P1 | General purpose signal header |
| JP6 | Off-board remote sensor connection |
| J1 | PC Parallel port connector, DB25M, for use with Micrel DemoWare software. |
| J2 | Optional serial bus host connector, 4-pin |

**Test Points**

| Designator | Description |
|---|---|
| TP1 | $V_{DD}$ |
| TP2 | Ground |
| TP3 | Serial Data |
| TP4 | Serial Clock |
| TP5 | Interrupt |
| TP6 | External $V_{DD}$ |
| TP7 | Ground |

**Jumper Options**

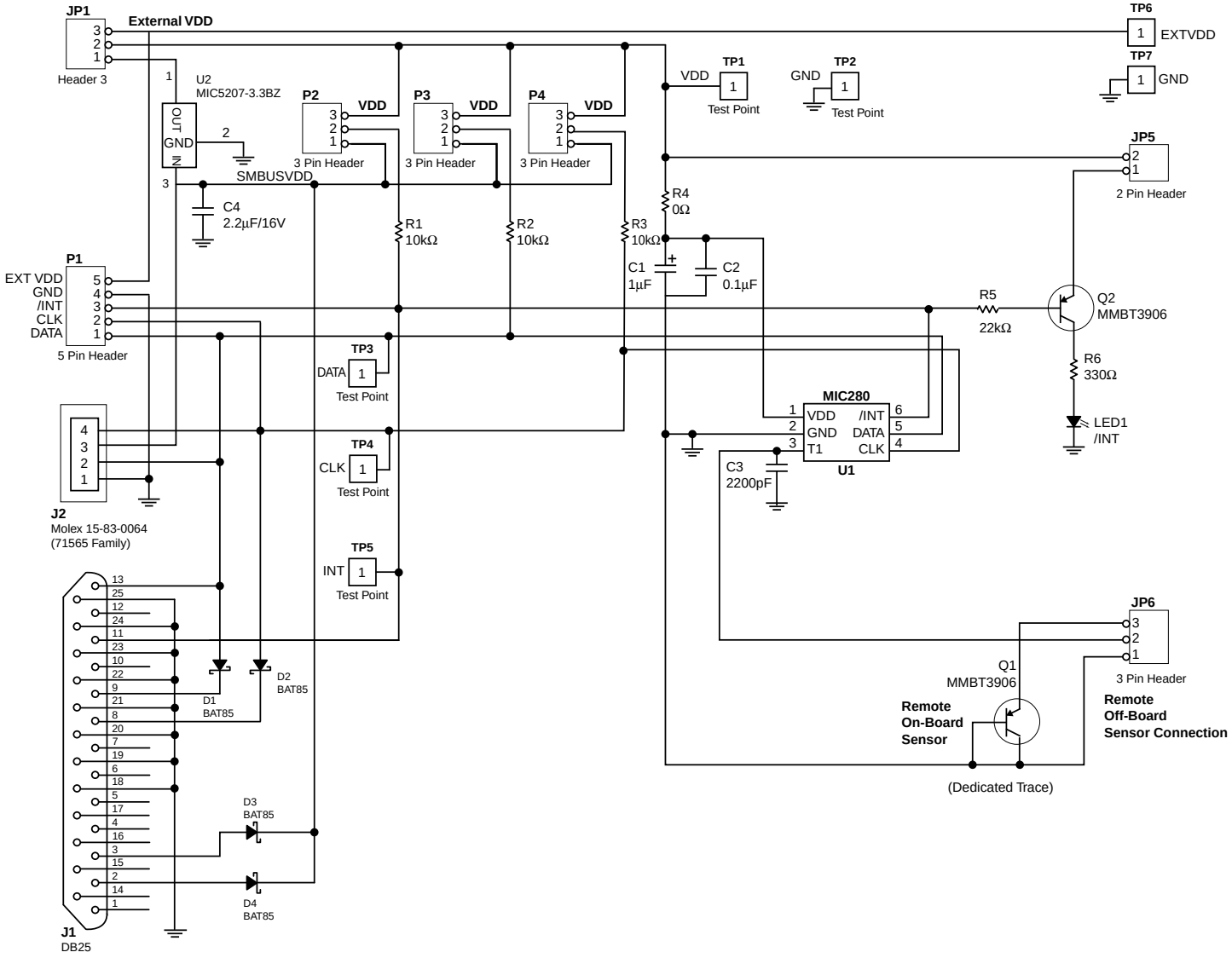
| Jumper | Position | Function | Factory Setting |
|---|---|---|---|
| JP1 | 1-2<br>2-3 | Use $V_{DD}$ from PC parallel port (output of MIC5207 LDO)<br>Use External $V_{DD}$ via TP6, JP1, or P1 | Shorted<br>Open |
| JP2 | 1-2<br>2-3 | Use $V_{DD}$ from J2 or PC port as pull-up voltage for /INT<br>Use MIC280 $V_{DD}$ as pull-up voltage for /INT | Shorted<br>Open |
| JP3 | 1-2<br>2-3 | Use $V_{DD}$ from J2 or PC port as pull-up voltage for DATA<br>Use MIC280 $V_{DD}$ as pull-up voltage for DATA | Shorted<br>Open |
| JP4 | 1-2<br>2-3 | Use $V_{DD}$ from J2 or PC port as pull-up voltage for CLK<br>Use MIC280 $V_{DD}$ as pull-up voltage for CLK | Shorted<br>Open |
| JP5 | Shorted<br>Open | Enables LED<br>Disables LED | Shorted |
| JP6 | 1-2<br>Open | On-board transistor Q1 is used as remote sensor.<br>Connect remote diode between 2-3 for off-board sensor connection. | Shorted |

***** Pin number one of each header is denoted by a square pad on the PCB versus a round pad for all other pins. The pads are visible on the back side of the printed circuit board.

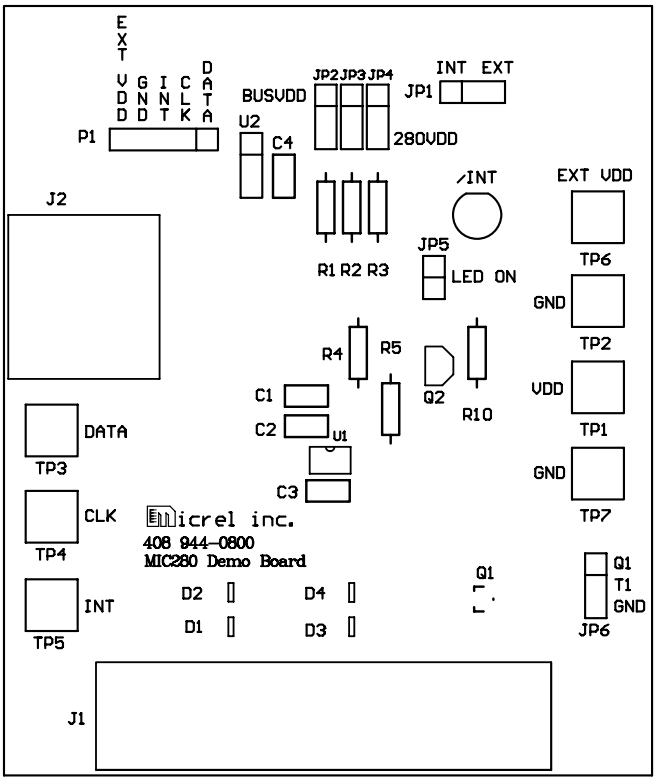
## Bill of Materials

| Item | Part Number | Manufacturer | Description | Qty. |
|---|---|---|---|---|
| C1 | ECS-F1CE105K | Panasonic - ECG | 1µF, 16V, tantalum capacitor | 1 |
| C2 | ECU-S1H104KBB | Panasonic - ECG | 0.1µF, 50V, 20% ceramic capacitor | 1 |
| C3 | K222J15C0GF5TL2 | BC Components | 2200pF, 50V, 5% ceramic capacitor | 1 |
| C4 | ECS-F1CE225K | Panasonic - ECG | 2.2µF, 16V, tantalum capacitor | 1 |
| D1 | MA741-(TX) | Panasonic - SSG | Schottky diode, 30V, 30MA, S-MINI, 3-pin | 1 |
| D2 | MA741-(TX) | Panasonic - SSG | Schottky diode, 30V, 30MA, S-MINI, 3-pin | 1 |
| D3 | MA741-(TX) | Panasonic - SSG | Schottky diode, 30V, 30MA, S-MINI, 3-pin | 1 |
| D4 | MA741-(TX) | Panasonic - SSG | Schottky diode, 30V, 30MA, S-MINI, 3-pin | 1 |
| J1 | DB25M | Any | Male parallel port connector | 1 |
| J2 | 15-83-0064 | Molex | SMBus host connector | 1 |
| JP1 | Any | Any | 3-pin header | 1 |
| JP2 | Any | Any | 3-pin header | 1 |
| JP3 | Any | Any | 3-pin header | 1 |
| JP4 | Any | Any | 3-pin header | 1 |
| JP5 | Any | Any | 2-pin header | 1 |
| JP6 | Any | Any | 3-pin header | 1 |
| P1 | Any | Any | 5-pin header | 1 |
| LED1 | LTL-4203 | Lite-On Inc. | Red LED | 1 |
| Q1 | MMBT3906 | Motorola | PNP transistor, SOT-23 | 1 |
| Q2 | 2N3906 | Motorola | PNP transistor, TO-92 | 1 |
| R1 | CFR-25JB-10K | Yageo | 10kΩ, 1/4W, 5% resistor | 1 |
| R2 | CFR-25JB-10K | Yageo | 10kΩ 1/4W, 5% resistor | 1 |
| R3 | CFR-25JB-10K | Yageo | 10kΩ 1/4W, 5% resistor | 1 |
| R4 | ZOR-25-B | Yageo | 0Ω 1/4W, 5% resistor | 1 |
| R5 | CFR-25JB-22K | Yageo | 22kΩ 1/4W, 5% resistor | 1 |
| R6 | CFR-25JB-330R | Yageo | 330Ω 1/4W, 5% resistor | 1 |
| TP1 | 1502-2 | Keystone Electronics | Turret terminal | 1 |
| TP2 | 1502-2 | Keystone Electronics | Turret terminal | 1 |
| TP3 | 1502-2 | Keystone Electronics | Turret terminal | 1 |
| TP4 | 1502-2 | Keystone Electronics | Turret terminal | 1 |
| TP5 | 1502-2 | Keystone Electronics | Turret terminal | 1 |
| TP6 | 1502-2 | Keystone Electronics | Turret terminal | 1 |
| TP7 | 1502-2 | Keystone Electronics | Turret terminal | 1 |
| U1 | **MIC280BMM** | **Micrel Semiconductor** | Local/Remote Thermal Supervisor | 1 |
| U2 | **MIC5207-3.3BZ** | **Micrel Semiconductor** | 180mA Low Noise LDO Regulator | 1 |

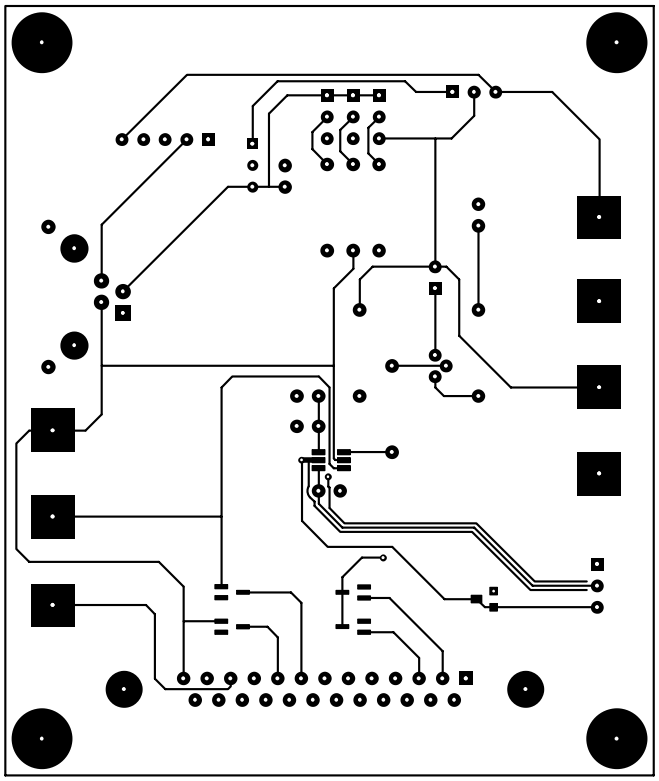
## Schematic


JP1
External VDD
Header 3
U2
MIC5207-3.3BZ
OUT
GND
SMBUSVDD
C4
2.2µF/16V
P2
P3
P4
VDD
3 Pin Header
R1
10kΩ
R2
10kΩ
R3
10kΩ
R4
0Ω
C1
1µF
C2
0.1µF
TP1
TP2
Test Point
TP6
EXTVDD
TP7
GND
JP5
2 Pin Header
P1
EXT VDD
GND
/INT
CLK
DATA
5 Pin Header
TP3
TP4
TP5
J2
Molex 15-83-0064
(71565 Family)
MIC280
U1
C3
2200pF
R5
22kΩ
Q2
MMBT3906
R6
330Ω
LED1
/INT
JP6
Q1
MMBT3906
Remote
On-Board
Sensor
Remote
Off-Board
Sensor Connection
(Dedicated Trace)
D1
BAT85
D2
BAT85
D3
BAT85
D4
BAT85
J1
DB25

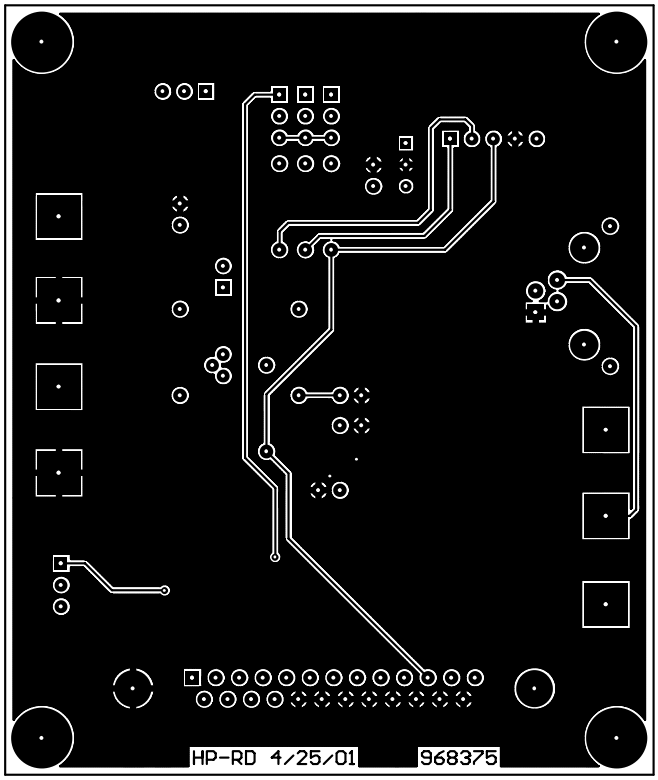
## PC Board Layout




**PC Board Layout - Top Silkscreen**



**PC Board Layout - Component Side**




**PC Board Layout - Solder Side**

## MIC280 DemoWare™ Software

### System Requirements

The DemoWare software is designed to run on any personal computer running Microsoft Windows 95, Windows 98, and compatible operating systems. A standard parallel printer port is required for communication with the MIC280 evaluation board. (The software requires direct access to the parallel printer port at the hardware level. Operating systems such as Windows NT and Windows 2000 do not permit such access.) Once decompressed and installed, the DemoWare files will occupy approximately 1.7MB of hard disk space.

### Installing the Software

The MIC280 DemoWare is available for download at: http://www.micrel.com.

If you are unable to obtain the software from the Micrel website, please contact a Micrel sales representative for assistance. To install the MIC280 DemoWare:

1. Download the file “MIC280dwzip.exe” into a temporary directory. This file is a self-extracting ZIP archive containing the files *MIC280DemoWare.exe* and *Mfc42.dll. MIC280DemoWare.exe* is the program itself. *Mfc42.dll* is a library containing code used by *MIC280DemoWare.exe*.
2. Start the extraction process by selecting **Run** on the **Start** menu and choosing the file *MIC280DemoWare.exe*. *MIC280DemoWare.exe* and *Mfc42.dll* will be extracted and saved into a subdirectory named *MIC280DemoWare* in the root directory of the hard disk. If you wish to use a different directory, enter its name in the “Unzip to folder” text box or select the **Browse** option. This directory will be created if necessary.
3. Select “Unzip” and the files will be extracted.
4. A message stating “2 file(s) unzipped successfully” will be displayed when the process is finished. Click “OK” to proceed.
5. Click “Close” to complete the process and exit the installation utility.

### Running the Software

Launch the software by selecting **Run** on the **Start** menu and selecting the file *MIC280DemoWare.exe*. If the installation defaults were used, this file will be in a subdirectory called “MIC280DemoWare” in the root directory on the hard disk. Once the program starts, the main window will be displayed and power to the evaluation board will be off. Any status or error messages displayed are not valid until the software is properly configured and the board is powered on.

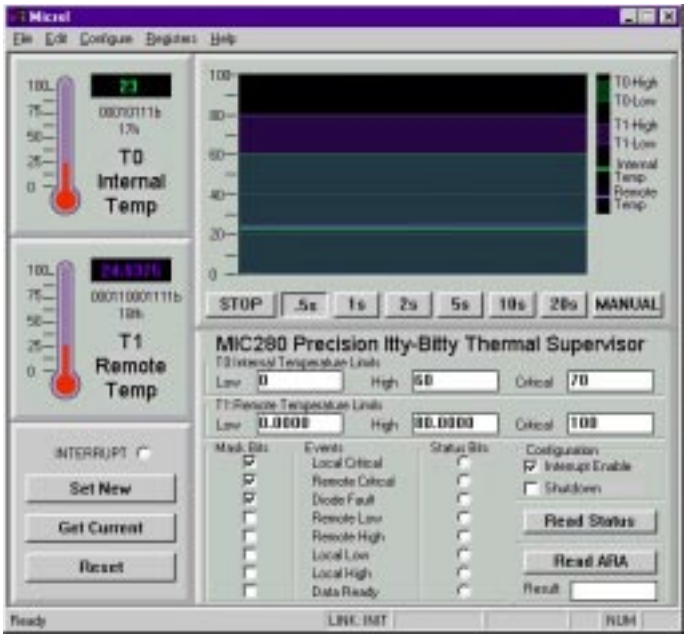



**Figure 4. MIC280 DemoWare Main Window**

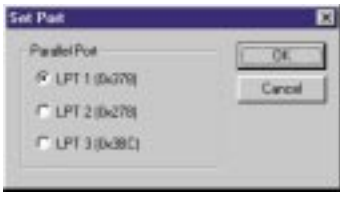



**Figure 5. Selecting The Printer Port**


**Figure 6. Selecting the Device Type and Base Address**

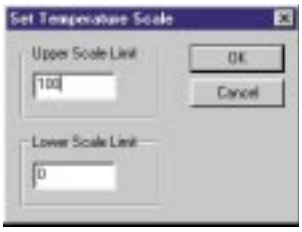



**Figure 7. Selecting the Chart Recorder Scale**

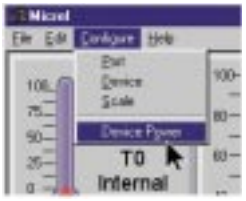



**Figure 8. Turning on Power to the Evaluation Board**

**Using the Software**

The software must be configured prior to use:

1. Select the printer port to which the board will be connected using the **Port** item on the **Configure** Menu as shown in Figure 5.
2. Select the device base address using the **Device** item on the **Configure** menu as shown in Figure 6. The factory populates the evaluation board with a MIC280-0BM6. The base address therefore defaults to 0x48.
3. Adjust the chart recorder scale using the **Scale** item on the **Configure** menu. (Figure 7) Only temperature values between **Upper Scale Limit** and **Lower Scale Limit** will be displayed in the chart recorder window. Enter the desired values in the text boxes.

Clicking the **Get Current** button or any of the temperature acquisition buttons will automatically turn on power to the board. The power may also be turned on using the **Device Power** item on the **Configure** menu, as shown in Figure 8. When power is on, a checkmark will appear next to **Device Power** on the **Configure** menu. (In any case, the power should be turned off before removing the board from the PC by selecting the **Device Power** item on the **Configure** menu!)

Once power is turned on, the MIC280 registers will be read and the current values will be displayed. The main window should now appear similar to Figure 4.

The main window has several components:

- Temperature acquisition buttons and chart recorder (Figure 11): A single temperature sample may be taken by clicking the **MANUAL** button. Automatic temperature samples can be taken at specific intervals by clicking the **.5s, 1s, 2s, 5s, 10s**, or **20s** button. Any temperature samples taken will be displayed in the chart recorder area. Data for Zone 0, the internal zone, will be plotted in green, data for Zone 1, the external zone, will be plotted in blue.
- Status line (Figure 10): Status messages are displayed on the status line, including the state of the serial bus link, the logic state of the /INT pin, and the states of the Shift Lock and Num Lock keys.
- Thermometer display (Figure 9): The two thermometers will display the reported temperature in degrees Centigrade, binary and hexadecimal format for both zones.
- Register display (Figure 12): The Internal Temperature Limits and Remote Temperature Limits are displayed. The Mask register bits and Status register bits are also displayed. The Mask register bits must be set to allow the corresponding interrupt event to occur. *The **Set New** button must always be used to write any changes to the part.* Interrupt events are handled either by clicking the **Read Status** or **Read ARA** button. ***Always click the Read Status button after using the Read ARA button***.
- Control display (Figure 13): The **Set New** button, **Get Current** button, **Reset** button and **INTERRUPT** indicator are displayed in this box. The **Set New** button must always be used to write any changes to the part. Clicking **Get Current** updates the display of MIC280 register values. The **Reset button** initiates a warm reset on MIC280, returning it to its power-up state. The **INTERRUPT** indicator shows the current state of the MIC280's /INT output. Interrupts can be handled by either reading STATUS by clicking **Read Status** or by clicking the **Read ARA** button. ***Always click the Read Status button after using the Read ARA button***.

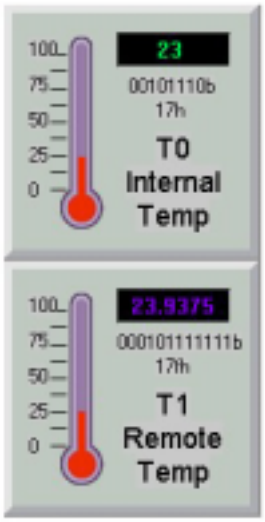



**Figure 9. Thermometer Displays**


**Figure 10. Status Line**

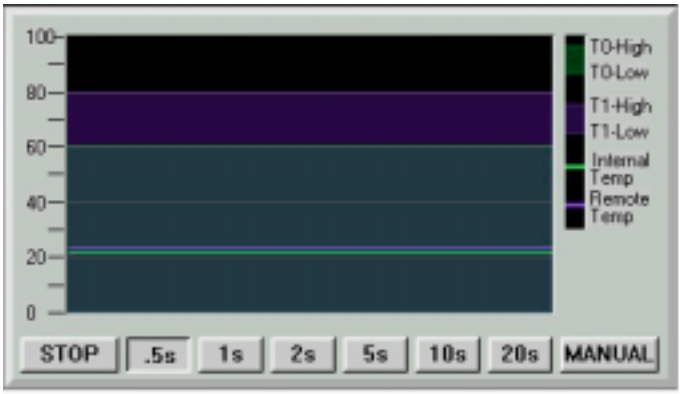



**Figure 11. Temperature Acquisition Window**

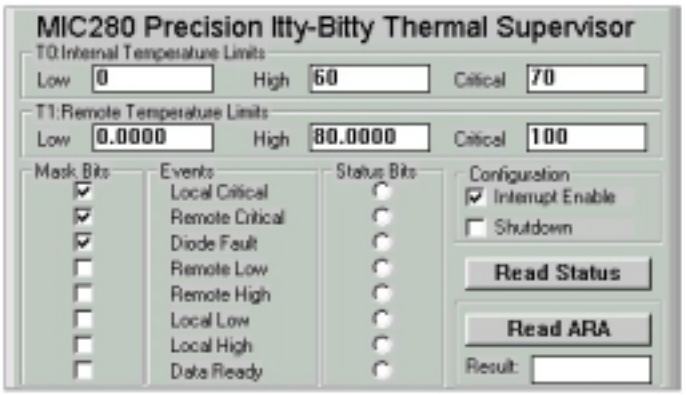



**Figure 12. Register Display**

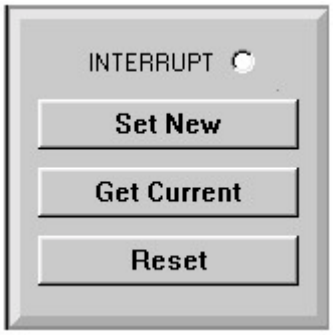



**Figure 13. Control Buttons**

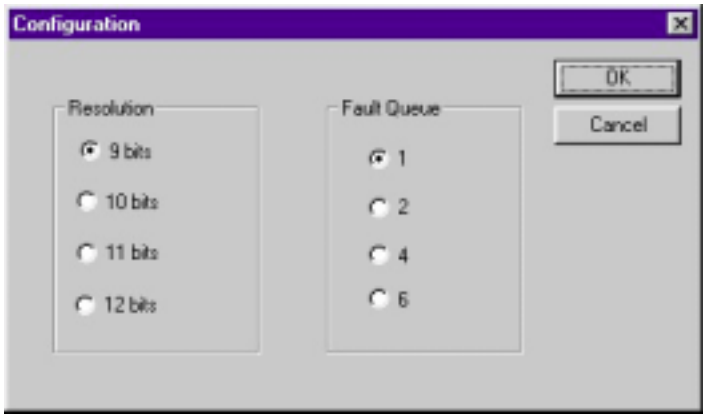



**Figure 14. Resolution and Fault Queue**

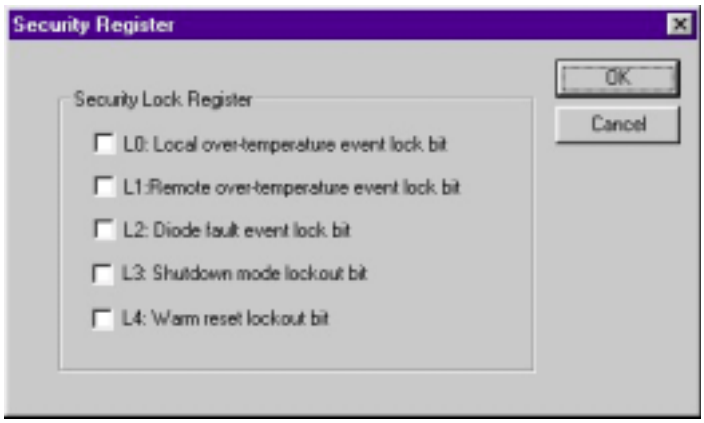



**Figure 15. Security Lock**

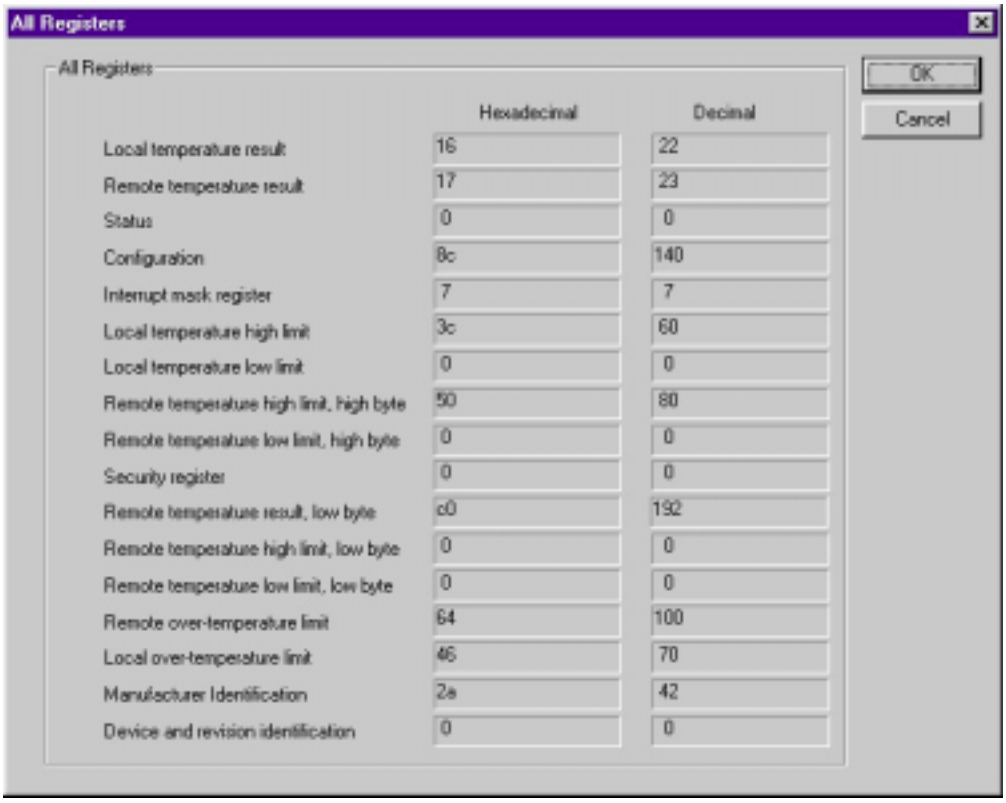



**Figure 16. Register Values**

### Acquiring Temperature Data

#### *Single Conversions*

Clicking the **MANUAL** button will cause a single temperature reading to be acquired from each zone. These readings will be displayed on the appropriate thermometer display and plotted on the chart recorder in the appropriate color. It will also be recorded to the log file if data logging is turned on. See **"Logging Data To a File"** below.

#### *Periodic Sampling*

Clicking any one of **.5s** or **1s** or **2s** or **5s** or **10s** or **20s** buttons will initiate repetitive temperature sampling at the indicated interval. The data acquired will be displayed on the appropriate thermometer display and plotted on the chart recorder in the appropriate color. The samples will also be recorded to the log file if data logging is turned on.

### Viewing and Modifying Registers

#### *Displaying Current Values*

The current values of the Internal and Remote temperature limits and mask bit settings can be displayed at any time by clicking the **Get Current** button.

#### *Restoring Register Defaults*

Clicking the reset button will return all registers to their default values.

#### *Setting Temperature Limits and Mask Bits*

The internal and remote temperature limit registers can be modified by typing the desired values into the **Low, High** and **Critical** edit boxes for each zone and then clicking the **Set New** button. Individual interrupt events are enabled by setting the appropriate Mask Bits box and then pressing the **Set New** button. *The **Set New** button must always be used to write new values to the MIC280 after any setting is modified on the screen.*

#### *Interrupt Handling*

Pending interrupts are indicated by the **INTERRUPT** indicator button. Interrupts are handled by either clicking the **Read Status** button or the **Read ARA** button. **Read Status** must always be used after reading the ARA using **Read ARA**. This resets the MIC280's interrupt logic, permitting /INT to be activated for the next event. Updated status bits are displayed on clicking **Read Status**. When an interrupt occurs, the corresponding bit is cleared in the interrupt mask register, IMASK. Setting the mask bit(s) and clicking **Set New** will allow future interrupts to occur.

#### *Changing Resolution and Fault Queue*

Resolution and fault queue settings can be made by selecting the **Configuration** item in the **Registers** menu. See Figure 14.

#### *Configuration Locking*

The lock bits can be altered by selecting the **Lock** item in the **Registers** menu. See Figure 15.

#### *Displaying All Register Values*

The values of all the MIC280 registers can be displayed by selecting the **ALL** item on the **Registers** menu.

### Logging Data to a File

All temperature data acquired during a given period may be logged to a file by activating the recording function. Recording is started by selecting the **Record to File...** item on the **File** menu.

1. Configure the device as desired via the register display window.
2. Click **Set New** to update the MIC280's configuration.
3. Activate data logging by selecting the **Record to File...** item on the **File** menu. Enter the desired file and path name and click **Save**. Note that the log file is a comma-delimited or *.csv file.
4. Acquire temperature data by clicking the **.5s, 1s, 2s, 5s, 10s, 20s**, or **MANUAL** buttons.
5. When finished recording data, stop data logging by once again selecting the **Record to File...** item on the **File** menu.

Micrel Data Log File created 07/27/2001 15:48:38

| DATE | TIME | ELAPSED | SAMPLE | INTERNAL | REMOTE |
|---|---|---|---|---|---|
| 7/27/01 | 15:48:38 | 0 | 0 | 23 | 24.4375 |
| 7/27/01 | 15:48:39 | 542 | 1 | 23 | 24.4375 |
| 7/27/01 | 15:48:39 | 1091 | 2 | 23 | 24.4375 |
| 7/27/01 | 15:48:40 | 1611 | 3 | 23 | 24.4375 |
| 7/27/01 | 15:48:42 | 3661 | 4 | 23 | 24.5 |
| 7/27/01 | 15:48:42 | 3673 | 5 | 23 | 24.4375 |
| 7/27/01 | 15:48:42 | 3687 | 6 | 23 | 24.4375 |
| 7/27/01 | 15:48:42 | 3742 | 7 | 23 | 24.4375 |
| 7/27/01 | 15:48:42 | 4291 | 8 | 23 | 24.4375 |
| 7/27/01 | 15:48:43 | 4840 | 9 | 23 | 24.4375 |
| 7/27/01 | 15:48:44 | 5342 | 10 | 23 | 24.4375 |
| 7/27/01 | 15:48:44 | 5884 | 11 | 23 | 24.4375 |
| 7/27/01 | 15:48:45 | 6433 | 12 | 23 | 24.4375 |

**Figure 17. Example Data Log**

An example data file is shown in Figure 17. This file may be opened in a program such as Microsoft Excel for graphing, filtering, sorting, manipulation, etc. The first line of the file identifies the file and the time and date when it was created. The second line lists the field names for the succeeding lines. The fields are as follows (in order):

- DATE: The date, according to the PC's system clock, that the sample was taken.
- TIME: The time, according to the PC's system clock, that the sample was taken.
- ELAPSED: The total elapsed time, in milliseconds, since the first sample was taken.
- SAMPLE: The sample number; samples are numbered sequentially starting with one.
- INTERNAL: The measured temperature for the internal zone, zone 0.
- REMOTE: The measured temperature for the remote zone, zone 1.

## Appendix A: SMBus Resources*

PC host adapters and software, bus analyzers, cables, and other items can be purchased from:

**Micro Computer Control Corporation**

PO Box 275/ 17 Model Ave.

Hopewell, New Jersey 08525 USA

Tel.: 609-466-1751

Email: info@mcc-us.com

http://www.mcc-us.com

**Saelig Company**

Tel.: 716-425-3753

Fax: 716-425-3835

Email: saelig@aol.com

http://www.memo.com/saelig

The 4-conductor serial bus connector is available from Molex as part number 15-83-0064. Mating plugs for constructing cable assemblies are also available. A list of distributors is available on the Molex website.

**Molex Incorporated**

2222 Wellington Court

Lisle, IL 60532-1682

Tel.: 800/78MOLEX,

630-969-4550 (Outside USA)

Fax: 630-968-8356

Tel.: 254069

E-mail: amerinfo@molex.com

http://www.molex.com

The current **SMBus** specification and other information regarding SMBus may be obtained from the SMBus website http://www.smbus.org.

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