

TMP75xEVM User's Guide

This user's guide describes the characteristics, operation, and use of the TMP75BEVM and TMP75CEVM evaluation modules, also referred to as the TMP75xEVM. This user guide discusses how to set up and configure the software and hardware, and reviews various aspects of the program operation. This document also includes an electrical schematic, printed circuit board (PCB) layout, and a bill of materials (BOM). Throughout this document, the terms evaluation board, evaluation module, and EVM are synonymous with the TMP75xEVM.

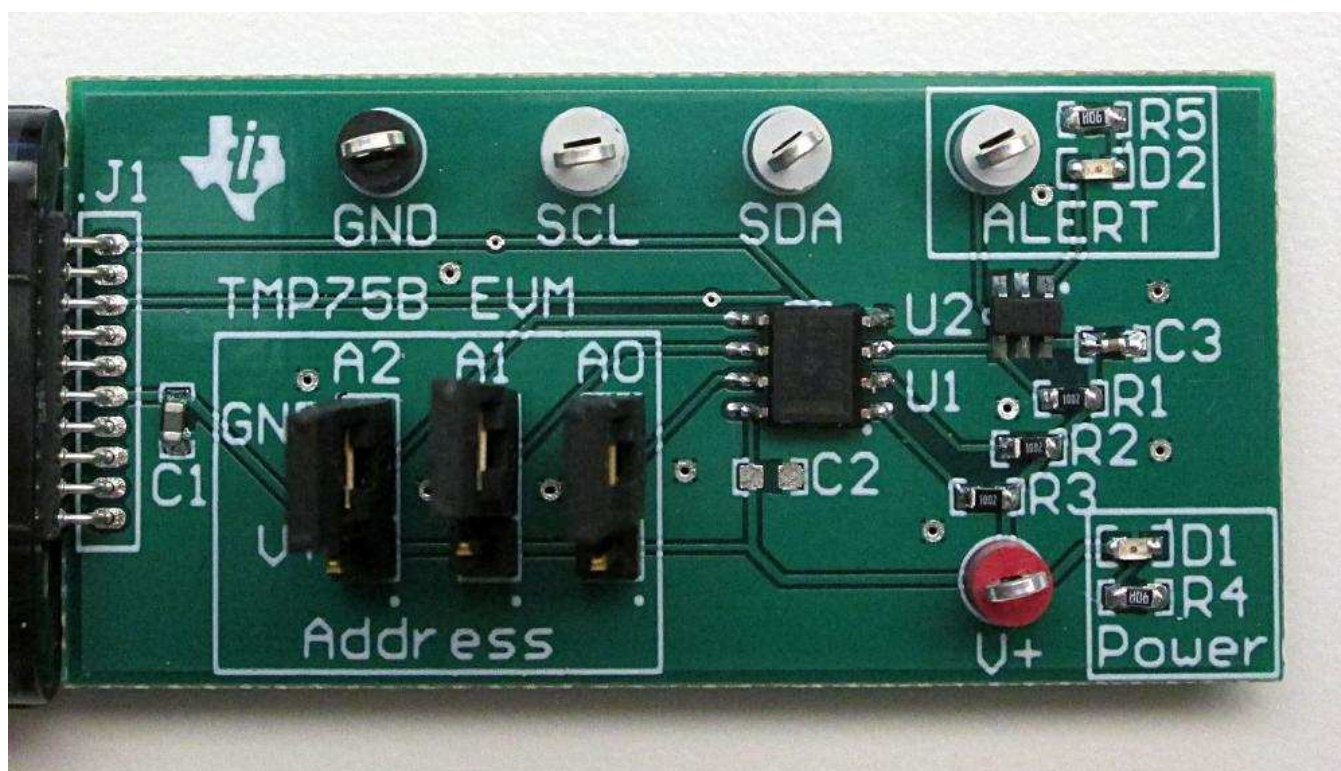


Figure 1. TMP75 EVM Test Board

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1 Overview

The [TMP75B](#) and [TMP75C](#) are digital output temperature sensors capable of reading temperatures from -40°C to $+125^{\circ}\text{C}$ with 12 bits (0.0625°C) of resolution. The TMP75B and TMP75C use a two-wire I²C™ protocol SMBus interface that allows up to eight devices on one bus. These devices are ideal for extended temperature measurement in communication, computer, consumer, environmental, industrial, and instrumental applications. The TMP75xEVM is a platform for evaluating the performance of the TMP75B and TMP75C under various conditions. The TMP75xEVM consists of two PCBs. The first is the [SM-USB-DIG](#) board that communicates with the computer, provides power, and sends and receives appropriate digital signals. The second is the TMP75 test board, which contains the TMP75B or TMP75C and its support circuitry.

1.1 TMP75xEVM Kit Contents

[Table 1](#) summarizes the contents of the TMP75xEVM kit. [Figure 2](#) shows the included hardware. Contact the [Texas Instruments Product Information Center](#) nearest you if any component is missing. It is highly recommended that you also check the [TMP75 product folder](#) on the TI web site at [www.ti.com](#) to verify you have the latest versions of the released software.

Table 1. TMP75xEVM Kit Contents

Item	Quantity
TMP75 test board	1
SM-USB-DIG board	1
USB extension cable	1
CR-ROM with TMP75xEVM software (<i>not shown</i>)	1
10-pin connector ribbon cable extender	1

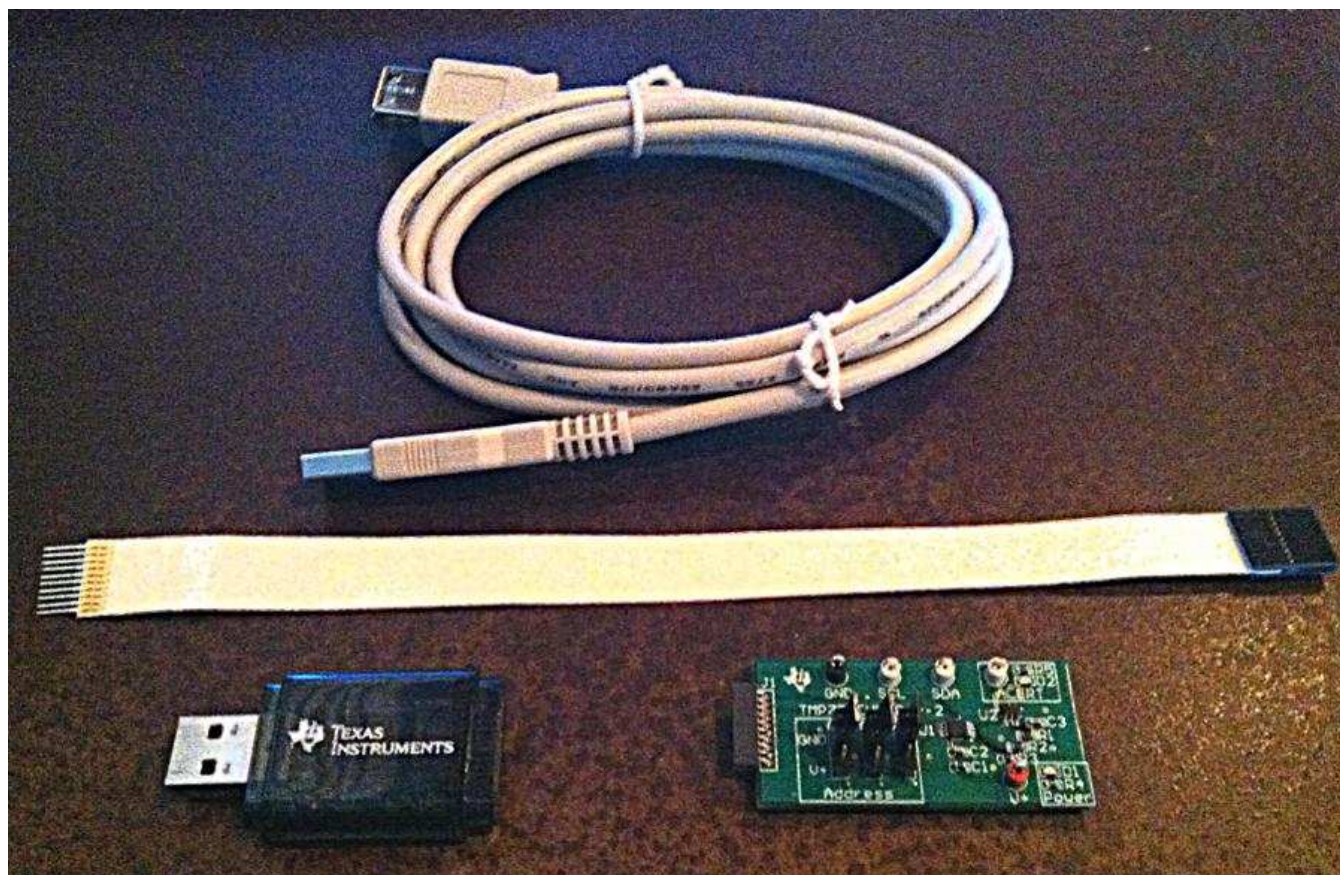


Figure 2. Hardware Included with TMP75xEVM Kit

1.2 Related Documentation from Texas Instruments

The documents listed in [Table 2](#) provide information regarding Texas Instruments' integrated circuits used in the assembly of the TMP75xEVM. This user's guide is available from the TI web site under literature number **SBOU141**. Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions may be available from the [TI web site](#), or call the Texas Instruments' Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number.

Table 2. Related Documentation

Document	Literature Number
TMP75 product data sheet	SBOS288
TMP75B product data sheet	SBOS706
TMP75C product data sheet	SBOS707
SM-USB-DIG platform user's guide	SBOU098

2 Hardware

[Figure 3](#) shows the system setup for the TMP75xEVM. The computer runs the graphical user interface (GUI) software that communicates with the SM-USB-DIG platform over a USB connection. The SM-USB-DIG platform translates the USB commands from the computer into power, I²C, SPI™, and general-purpose input/output (GPIO) commands for the TMP75 test board. Included with the kit is a board-to-board ribbon cable that goes between the SM-USB-DIG and the TMP75 test board. This ribbon-cable connection allows for some flexibility in board placement. TMP75xEVM operation does not require any additional components.

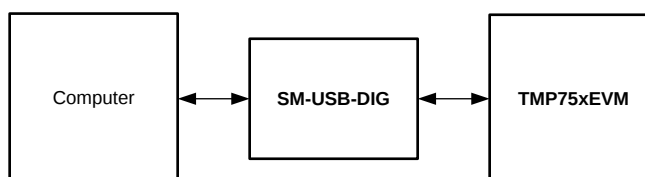


Figure 3. TMP75xEVM Hardware Setup

2.1 Theory of Operation for the TMP75xEVM

A block diagram of the TMP75 test board hardware is shown in Figure 4. The TMP75 test board contains connections for the power, I²C interface, and an interrupt signal. The TMP75 board also has test points that allow the board to be connected to hardware other than the SM-USB-DIG Platform for evaluation using an I²C interface.

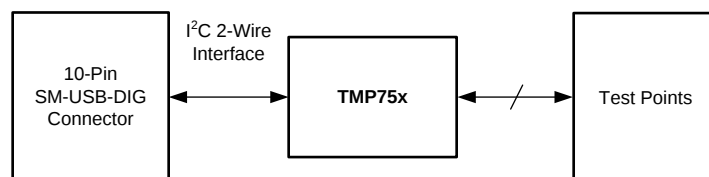


Figure 4. TMP75 Test Board Block Diagram

2.2 Theory of Operation for the SM-USB-DIG Platform

Figure 5 shows the block diagram for the SM-USB-DIG platform. This platform is a general-purpose data acquisition system that is used on several different Texas Instruments evaluation modules. The details of its operation are included in the SM-USB-DIG platform user's guide (SBOU98). The block diagram shown in Figure 5 is given as a brief overview of the platform.

The brain of the SM-USB-DIG platform is the TUSB3210. The TUSB3210 is an 8052 microcontroller that has a built-in USB interface. The microcontroller receives information from the host computer that is interpreted into power, I²C, SPI, and other digital I/O patterns. During the digital I/O transaction, the microcontroller reads the response of any device connected to the I/O interface. The response from the microcontroller is sent back, where it is interpreted by the host computer.

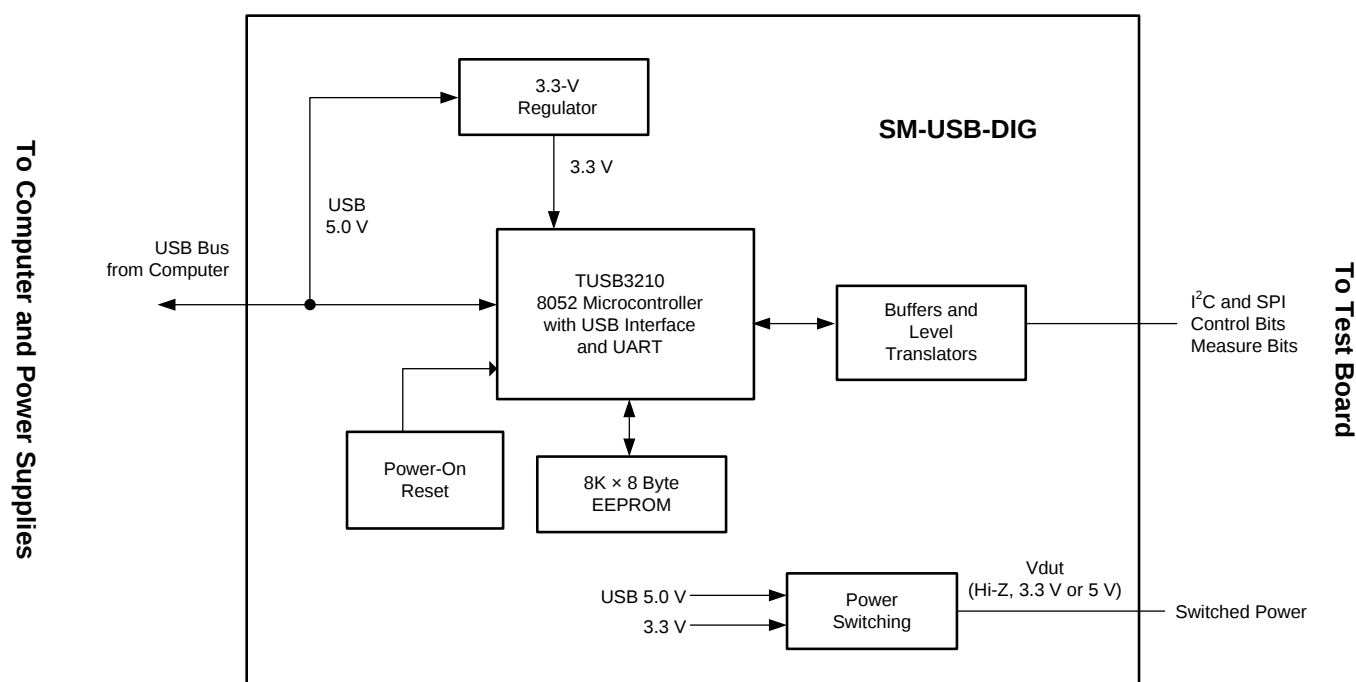


Figure 5. SM-USB-DIG Platform Block Diagram

2.3 TMP75xEVM Hardware Overview

If not already assembled, the basic hardware setup for the TMP75xEVM involves connecting the TMP75 test board to the SM-USB-DIG platform, and then connecting the USB cable. This section presents the details of this procedure.

CAUTION

Many of the components on the TMP75xEVM are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

2.3.1 Typical TMP75xEVM Hardware Setup

Connect the right-angle female socket on the TMP75 test board to the right-angle male header on the SM-USB-DIG platform, as shown in [Figure 6](#). Take special care to make sure that the two 10-pin sockets directly align with each other. Then, plug the female USB-A cable to the SM-USB-DIG platform. Lastly, plug the male USB-A cable into the computer.

NOTE: Always connect the two boards together before connecting the USB cable to avoid any issues if the connectors are misaligned.



Figure 6. Typical Hardware Connection

2.3.2 Plugging the SM-USB-DIG with TMP75 Test Board into the Computer

[Figure 7](#) shows the typical response when the SM-USB-DIG platform is plugged into the USB port of the computer for the first time. Typically, the computer responds with a *Found New Hardware, USB Device* pop-up dialog window. The pop-up window then typically changes to *Found New Hardware, USB Human Interface Device*. This pop-up indicates that the device is ready to be used. The SM-USB-DIG platform uses the human interface device drivers that are part of the Windows® operating system.

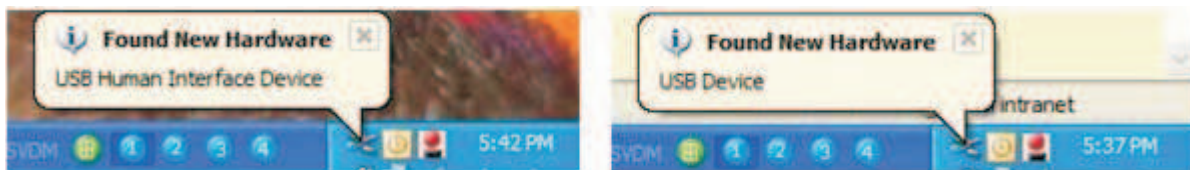


Figure 7. Typical Response After Connecting TMP75xEVM to the Computer

In some cases, the *Add Hardware Wizard* appears. If this installation prompt appears, allow the device manager to install the human interface device drivers by clicking Yes at each request to install the drivers.

3 Software

This section describes the installation and operation of the TMP75xEVM software.

3.1 Hardware Requirements

The TMP75xEVM software has been tested on the Windows 7® operating system (OS) with United States regional settings. The software should function correctly on other Windows operating systems.

3.2 Software Installation

The TMP75xEVM software is included on the CD that is shipped with the EVM kit. It is also available through the [TMP75xEVM Product Folder](#) on the TI web site (www.ti.com). To install the software to your computer, insert the supplied CD into an available CD-ROM drive, navigate to the TMP75xEVM software folder, and open the installer directory. Launch the TMP75xEVM installation file, setup.exe, as shown in [Figure 8](#)

Name ^	Date modified	Type	Size
bin	8/7/2013 11:40 AM	File folder	
license	8/7/2013 11:18 AM	File folder	
supportfiles	8/7/2013 11:41 AM	File folder	
nidist.id	8/7/2013 11:41 AM	ID File	1 KB
setup.exe	1/28/2013 4:41 PM	Application	1,394 KB
setup.ini	8/7/2013 11:41 AM	Configuration settings	13 KB

Figure 8. TMP75xEVM Software-Installation Files

The TMP75xEVM software then begins the installation process. After the install initializes, the user is given the choice of selecting the program destination directory, usually defaulting to C:\Program Files\TMP75xEVM and C:\Program Files\National Instruments as shown in [Figure 9](#).

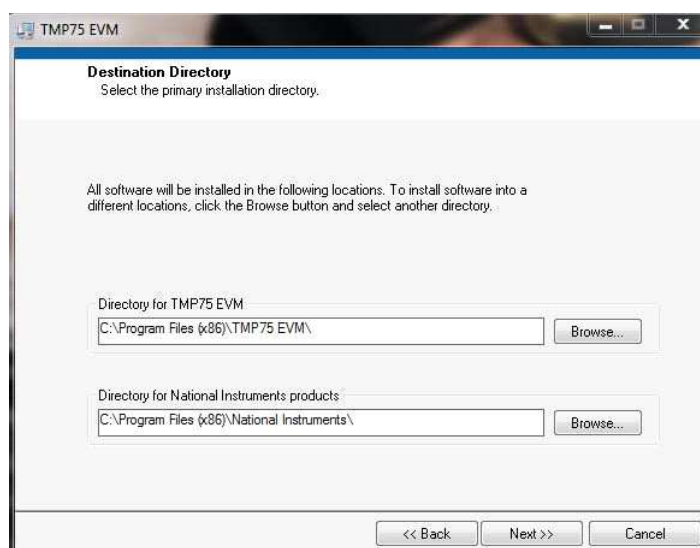


Figure 9. TMP75xEVM Software-Installation Prompts

After selecting the destination directory, read and accept the license agreements, and follow the prompts. After the installation process is completed click *Finish*. The TMP75xEVM GUI software is now installed.

3.3 Launching the TMP75xEVM Software

With the TMP75xEVM properly connected (see [Figure 6](#)), launch the EVM GUI software from the Windows *Start* menu. The file is located in a folder titled *TMP75xEVM*. The software launches with a screen similar to that shown in [Figure 10](#).

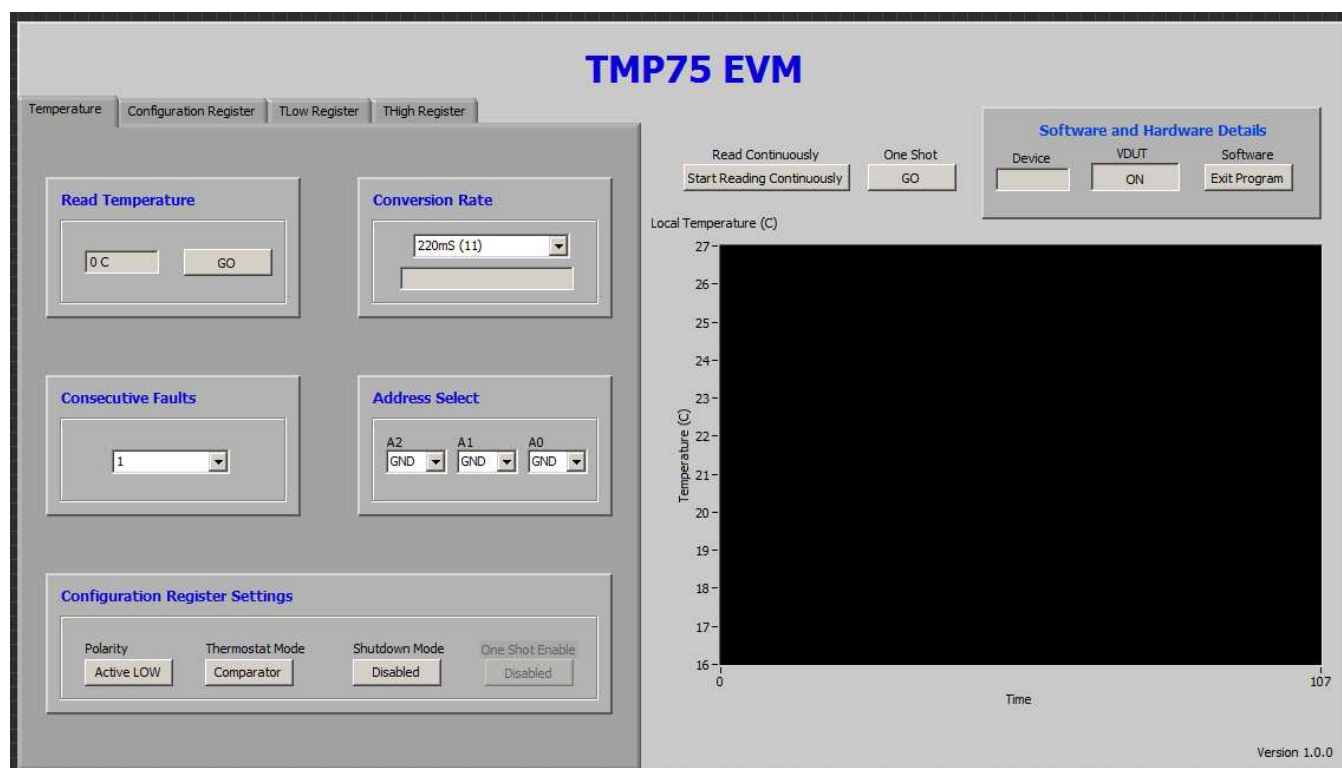


Figure 10. TMP75xEVM Main Operation Screen

If the message shown in [Figure 11](#) appears when the TMP75xEVM GUI software is launched, disconnect all components of the TMP75xEVM kit, and repeat the hardware assembly and connection instructions (see [Section 2.3](#)) and click *REFRESH*. If an address for a TMP75xEVM appears in the *Detected Addresses* selection box, select it and click *USE SELECTED* as shown in [Figure 12](#). Otherwise, close the software, reconnect the hardware and restart the software.

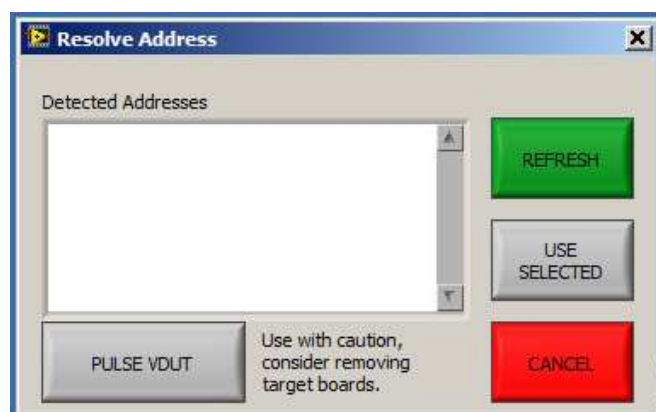


Figure 11. Hardware Connection Error Message



Figure 12. Hardware Connection Error Resolution

3.4 TMP75xEVM Software Operation

This section describes how to operate the TMP75xEVM software. The GUI has a primary tab that is used to configure and read from the TMP75xEVM, along with three other tabs that are used to access select registers of the TMP75 directly. Basic GUI functionality and a description of the tabs are also presented in this section.

3.4.1 Getting Started

With the hardware properly connected, and the EVM software installed and operating, check to see that the power to the device is turned on by looking at the LED on the SM-USB-DIG board and at the LED on the TMP75 test board in the silkscreen rectangle denoted *Power*, as shown in [Figure 13](#).

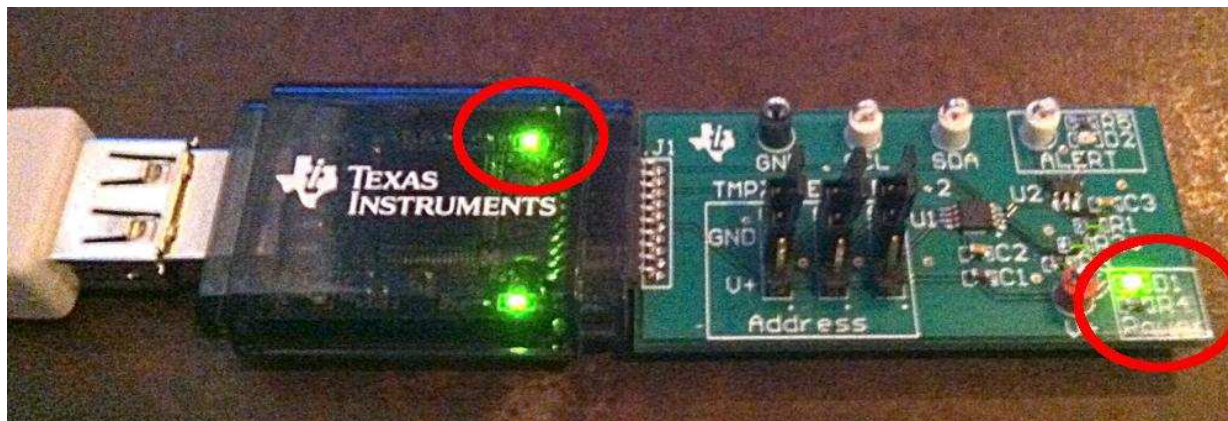


Figure 13. Power Indicators

Make sure the *Address Select* fields of the GUI match the positions of the A0, A1, and A2 jumpers on the TMP75 test board, as shown in [Figure 14](#).

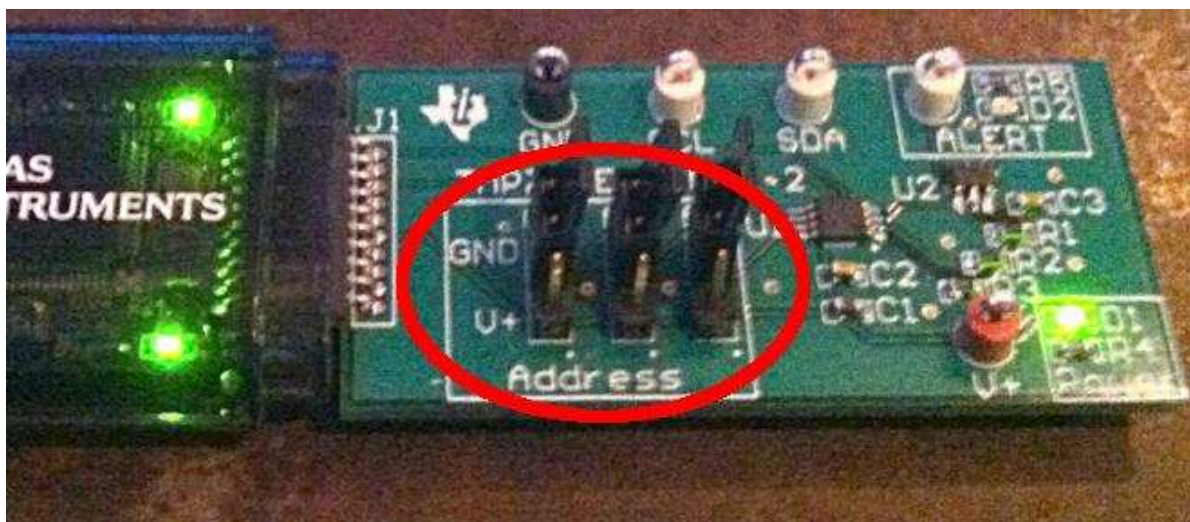


Figure 14. I²C Address Selection

If the TMP75xEVM is connected, the GUI successfully launched, and the TMP75 addressed correctly, then the software automatically detects the version of TMP75 populated on the TMP75 test board, and adjust the GUI software controls accordingly. The identified device is listed in the *Software and Hardware Details* box, as shown in [Figure 15](#).

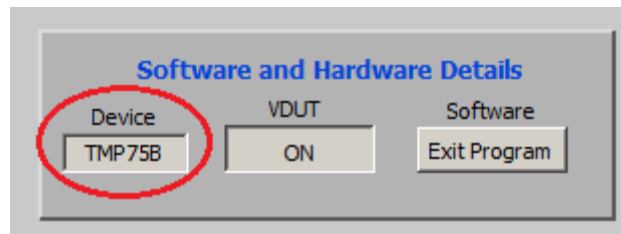


Figure 15. *Software and Hardware Details* Box

When first starting the TMP75xEVM software, confirm connections to the board by clicking the *Read Continuously* button (see [Figure 10](#)). If all devices are communicating correctly, the TMP75 temperature change over time is viewable in the the Local Temperature plot, as shown in [Figure 16](#).

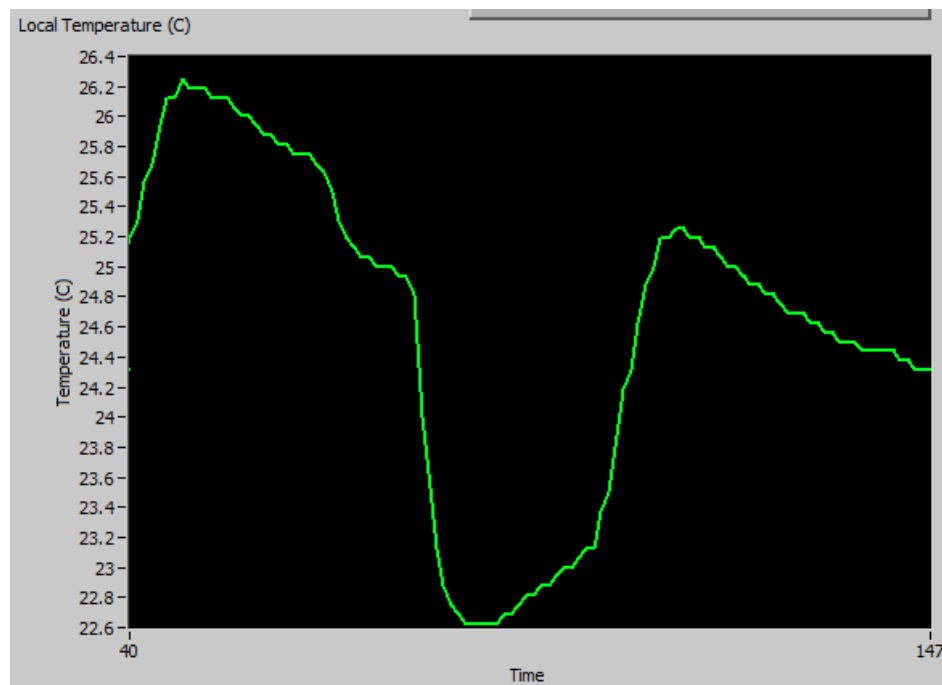


Figure 16. TMP75 Local Temperature Plot

3.4.2 Temperature Tab

The *Temperature* tab is the default tab of the TMP75xEVM software. It contains the controls for taking a temperature reading, setting the conversion rate, setting the consecutive faults, and enabling and disabling the different modes of the TMP75. Clicking any of these controls automatically writes the corresponding value to the Configuration Register.

3.4.2.1 Exercisable Features of the TMP75 on the Temperature Tab

The *Read Temperature* box (shown in [Figure 17](#)) shows the most recent temperature value recorded from the TMP75. This can be updated directly by clicking *GO* in the *Read Temperature* box.. Click the *Read Reg x00* button to update these fields and the plot with the latest values from the TMP75xEVM.

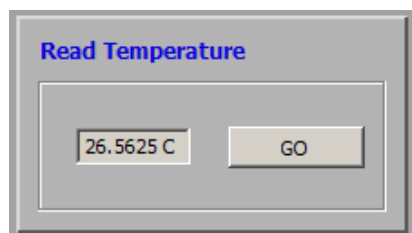


Figure 17. Read Temperature Box

If the version of the TMP75 connected to the test board supports variable, selectable conversion rates, then the *Conversion Rate* box is enabled and the rates available populate in the drop-down selection field, as shown in [Figure 18](#).

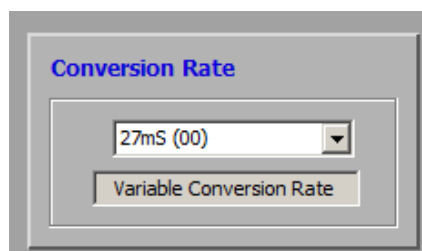


Figure 18. Conversion Rate Selection Box

[Figure 19](#) shows the *Consecutive Faults* box, which features a drop-down menu that allows for selecting the number of consecutive fault conditions the TMP75 must record before setting or resetting the ALERT pin.

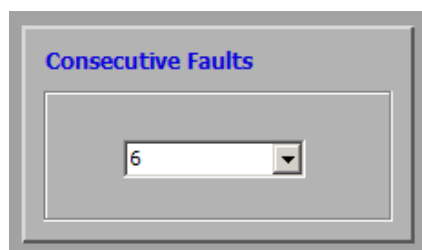


Figure 19. Consecutive Faults Box

The *Configuration Register Settings* box, shown in [Figure 20](#), contains several toggle controls that define the behavior of the TMP75. Select features are unavailable if the detected TMP75 version does not support the control. *Polarity* configures the output polarity of the ALERT pin. *Thermostat Mode* sets the device into comparator or interrupt mode, which defines the behavior of the ALERT pin with respect to the T_{HIGH} and T_{LOW} registers in the TMP75x device. *Shutdown Mode* places the TMP75 into a power-conservation mode or an active mode. Depending on the TMP75 version, the power-conservation mode works in conjunction with the *One Shot Enable* and *One Shot* buttons, to wake the device from power-conservation mode, take one measurement, and return to the power-conservation mode.

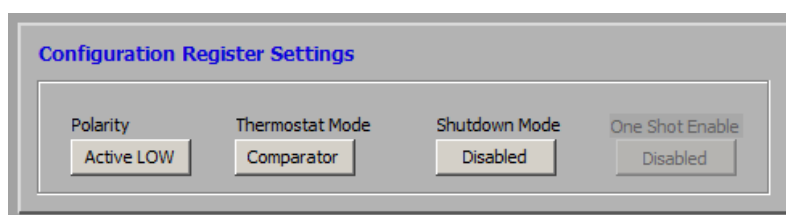
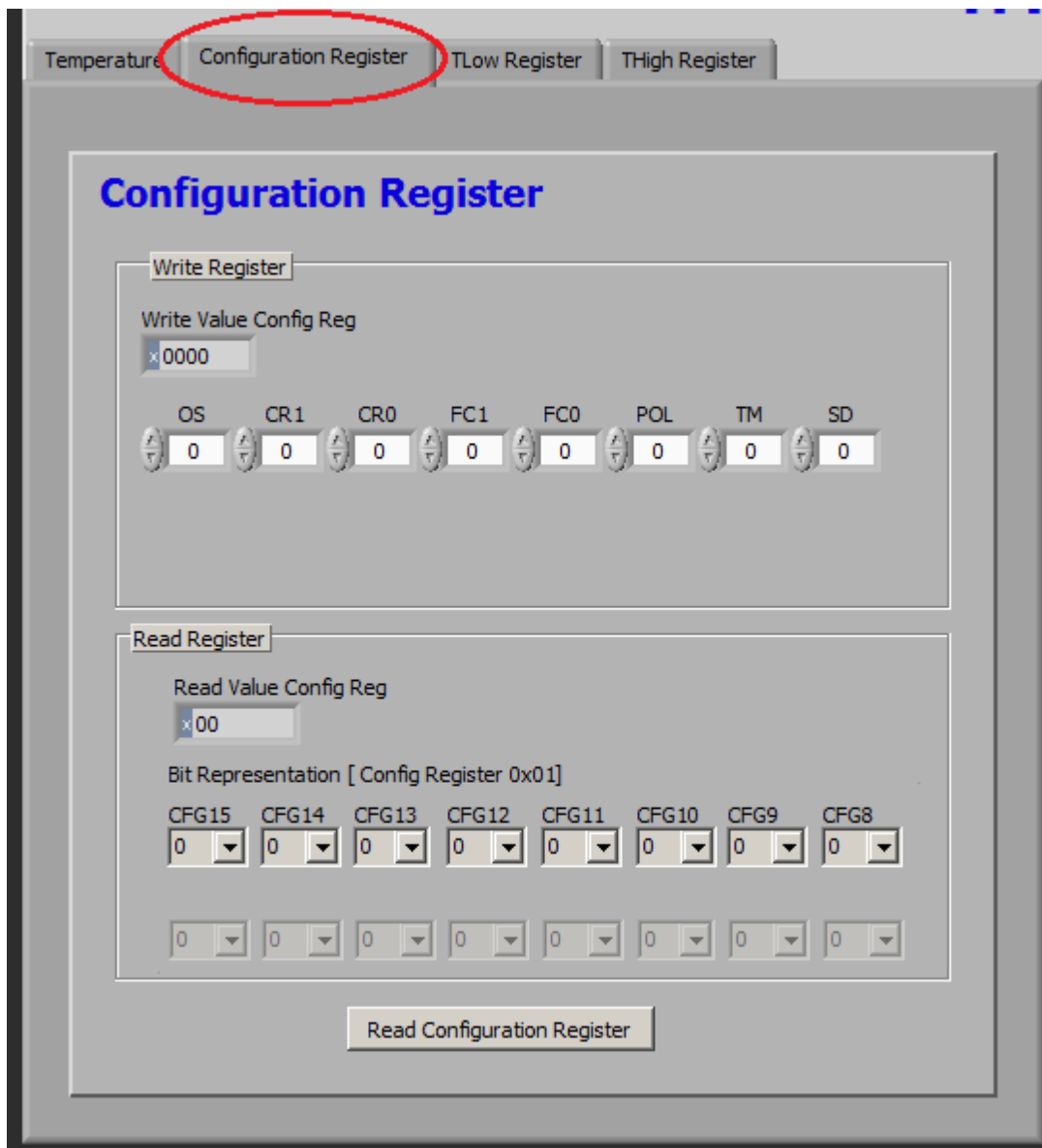


Figure 20. Configuration Register Settings Box

3.4.3 The Configuration Register Tab

The configuration register can be accessed directly, bit by bit, as shown in [Figure 21](#). This feature allows for control of the various device features, including shutdown, thermostat mode, fault count, conversion rate, and one-shot operation with binary or hex representations of the register values. Also, this tab allows for read back of the register contents to ensure the bits are properly set.



Configuration Register

Write Register

Write Value Config Reg
x0000

OS	CR1	CR0	FC1	FC0	POL	TM	SD
0	0	0	0	0	0	0	0

Read Register

Read Value Config Reg
x00

Bit Representation [Config Register 0x01]

CFG15	CFG14	CFG13	CFG12	CFG11	CFG10	CFG9	CFG8
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Read Configuration Register

Figure 21. Configuration Register Tab

3.4.4 The T_{HIGH} and T_{LOW} Register Tabs

The T_{LOW} Register tab shown in Figure 22 and the T_{HIGH} Register tab (see Figure 23) allow for setting the limits of the T_{LOW} and T_{HIGH} registers. This is done by entering a temperature value in the *Write T_{LOW} Limit* numeric field or in the *Write T_{HIGH} Limit* numeric field. Confirm the limit by clicking the *Read T_{LOW} Register* or *Read T_{HIGH} Register* buttons. When the temperature crosses the T_{LOW} or T_{HIGH} limit, the alert pin is tripped, causing LED D2 to illuminate or deluminate, depending on the thermostat mode selected and the polarity chosen.

The screenshot shows the 'TLow Register' tab selected in a software interface. The tab is highlighted with a red circle. The interface includes the following elements:

- Temperature**, **Configuration Register**, **TLow Register** (selected), and **THigh Register** tabs.
- TLow Register** title.
- Write Register** section:
 - Write TLow Limit**: A numeric input field with the value '20'.
 - Bit Representation [TLow Register 0x10]**: A display showing the bit values for L11 through L0.

L11	L10	L9	L8	L7	L6	L5	L4
0	0	0	1	0	1	0	0
- Read Register** section:
 - Read TLow Temp**: A numeric input field with the value '20'.
 - Read TLow Reg (HEX)**: A numeric input field with the value 'x 1400'.
 - Bit Representation [TLow Register 0x10]**: A display showing the bit values for L11 through L0.

L11	L10	L9	L8	L7	L6	L5	L4
0	0	0	1	0	1	0	0
- Read TLow Register** button.

Figure 22. T_{LOW} Register Tab

The screenshot shows the 'THigh Register' tab selected in a software interface. The tab is circled in red. Below the tab name, there are two main sections: 'Write Register' and 'Read Register'.

Write Register Section:

- Write THigh Limit:** A text box containing the value '40'.
- Bit Representation [THigh Register 0x11]:** A grid of 12 dropdown menus for bits H11 through H0. The values are: H11=0, H10=0, H9=1, H8=0, H7=1, H6=0, H5=0, H4=0, H3=0, H2=0, H1=0, H0=0.

Read Register Section:

- Read THigh Temp:** A text box containing the value '40'.
- Read THigh Reg (HEX):** A text box containing the value 'x2800'.
- Bit Representation [THigh Register 0x11]:** A grid of 12 dropdown menus for bits H11 through H0. The values are: H11=0, H10=0, H9=1, H8=0, H7=1, H6=0, H5=0, H4=0, H3=0, H2=0, H1=0, H0=0.
- Read THigh Register:** A button at the bottom of the section.

Figure 23. T_{HIGH} Register Tab

4 Schematic, PCB Layout, and Bill of Materials

4.1 Schematic

Figure 24 shows the complete schematic of the TMP75 test board. U1 is the TMP75 device. SDA and SCL are pulled up by the SM-USB-DIG platform so no pull-up resistors are required, but R2 and R3 are added in case a different I²C master must be used without the pull-ups present. R1 is a pull-up resistor for the ALERT signal. C1, C2, and C3 are bypass capacitors for V+. D1 is an LED in series with R4 that illuminates when power is applied to the board. A0, A1, and A2 are three-post, 100-mil spaced, jumper-selectable terminal blocks that set the I²C address of the TMP75 device. U2 buffers the ALERT signal and feeds the serially connected LED D2 and R5, to illuminate and deluminate with the state of the ALERT pin.

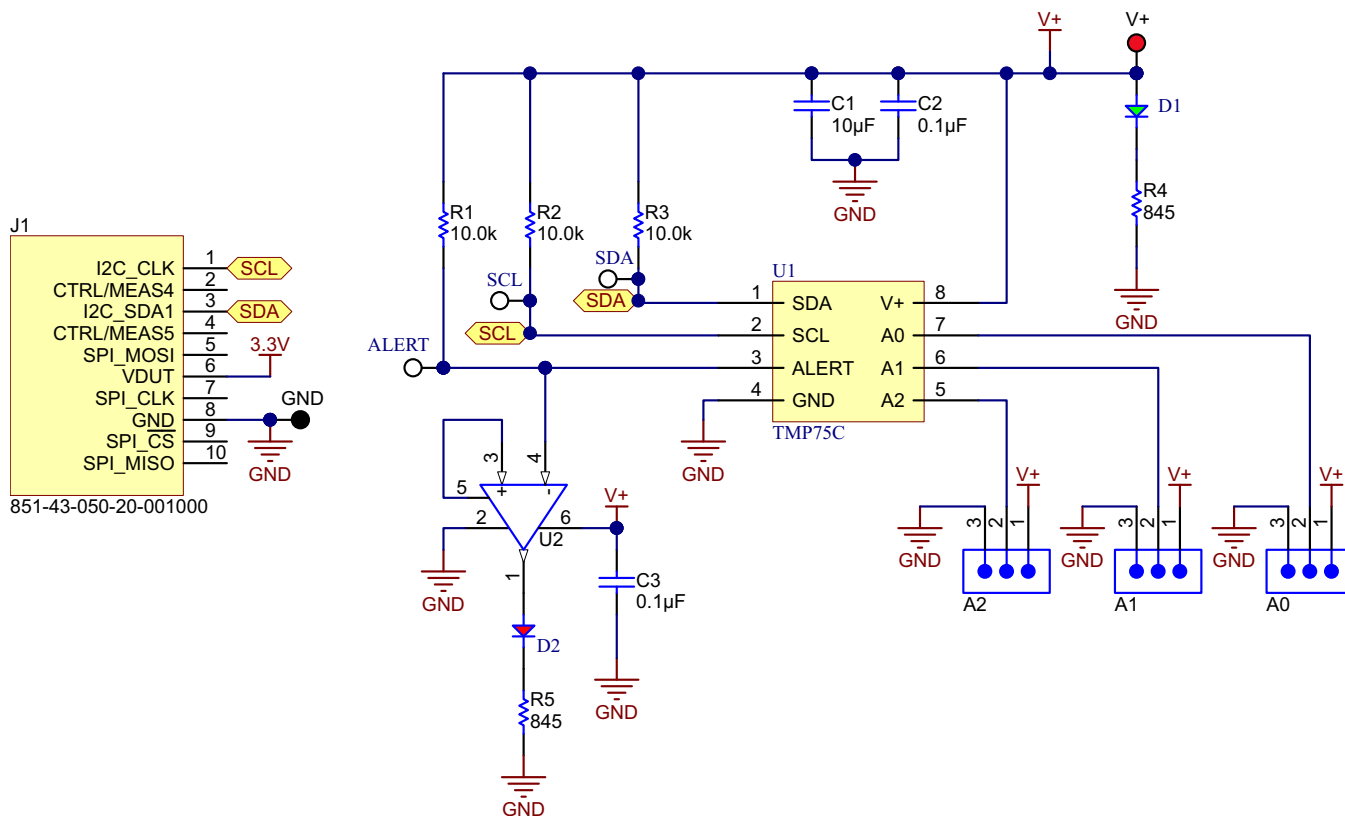


Figure 24. TMP75 Test Board Schematic

4.2 PCB Layout

Figure 25 and Figure 26 show the top and bottom layers, respectively, of the test board.

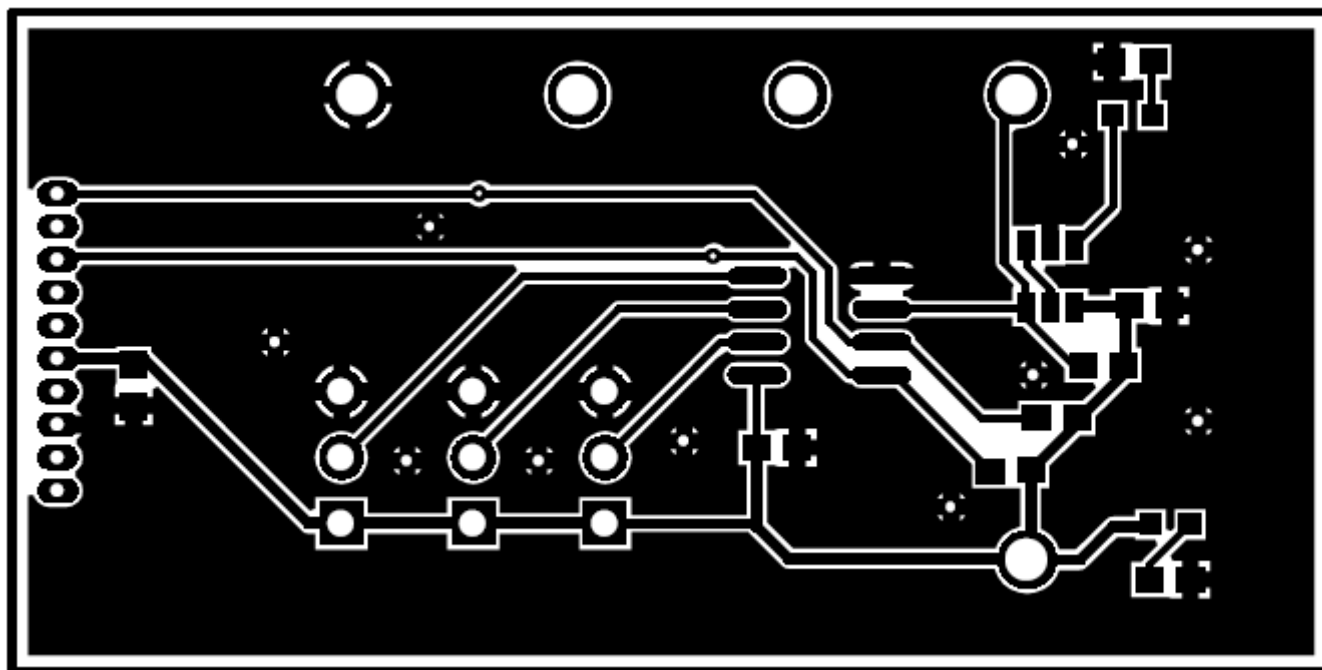


Figure 25. PCB Top Layer

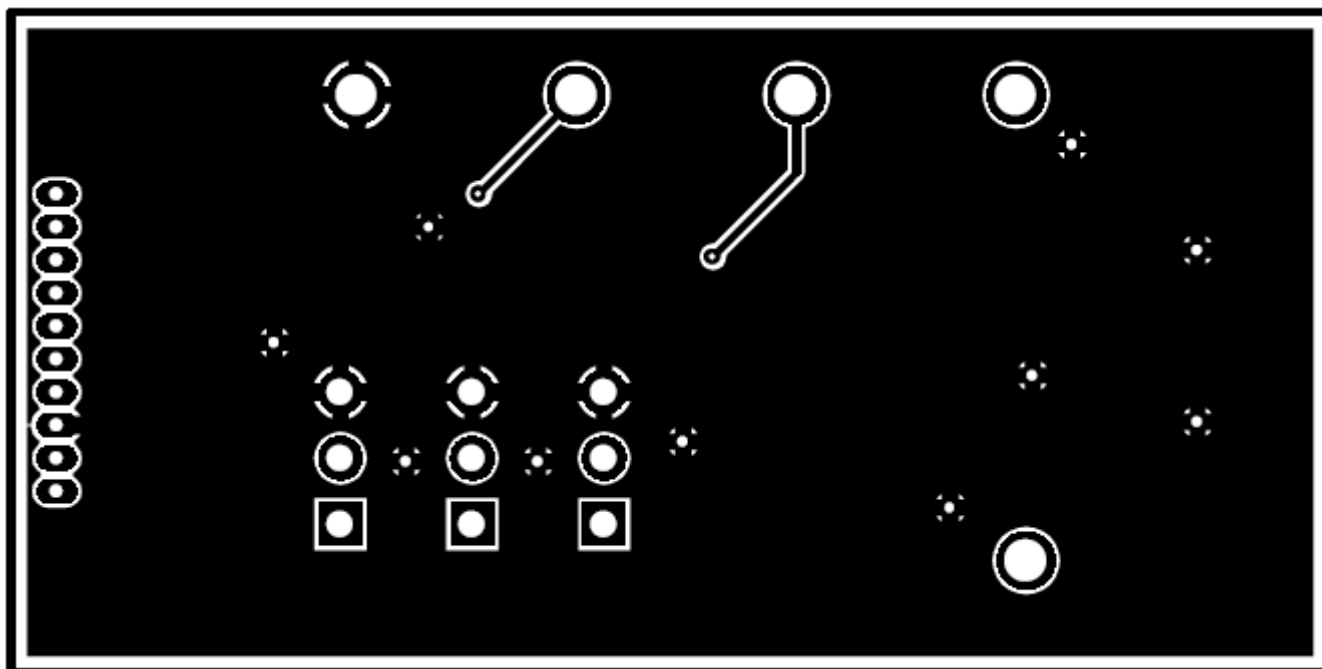


Figure 26. PCB Bottom Layer

Figure 27 shows the assembly drawing of the top layer.

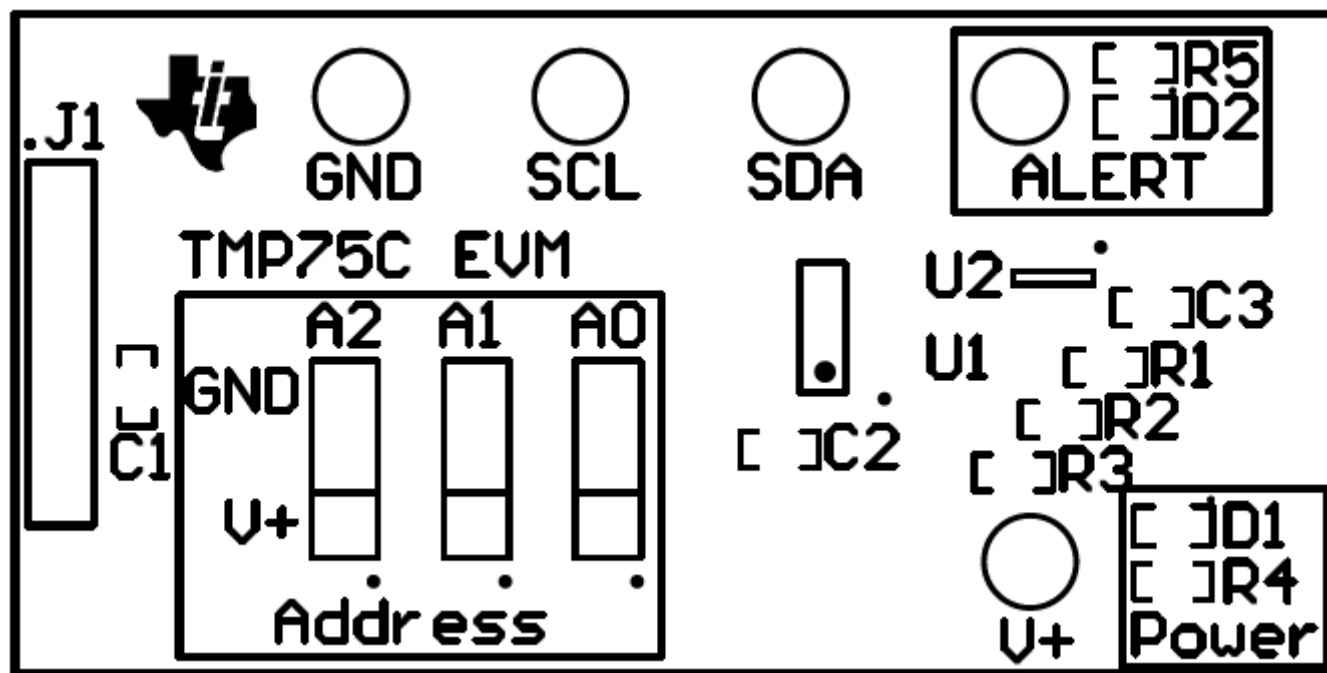


Figure 27. PCB Top Layer Assembly Drawing

4.3 Bill of Materials for the TMP75 Test Board

Table 3 lists the bill of materials for the TMP75 test board.

Table 3. Bill of Materials

Qty	RefDes	Description	Part Number	Manufacturer
3	A0, A1, A2	CONN HEADER VERT SGL 3POS GOLD	961103-6404-AR	3M
3	ALERT, SCL, SDA	Test Point, TH, Compact, White	5007	Keystone
1	C1	CAP, CERM, 10uF, 6.3V, +/-20%, X5R, 0603	C0603C106M9PACTU	Kemet
2	C2, C3	CAP, CERM, 0.1uF, 25V, +/-5%, X7R, 0603	C0603C104J3RAC	Kemet
1	D2	LED GREEN 0603	SM0603GC	Bivar
1	D1	LED RED 0603	SM0603URC	Bivar
1	U1	IC DIG TEMP SEN 2WIRE 8-SOIC	TMP75B or TMP75C, depending on the EVM being built	Texas Instruments
1	GND	Test Point, TH, Compact, Black	5006	Keystone
4	H1, H2, H3, H4	Bumpon, Cylindrical, 0.312 X 0.200, Black	SJ61A1	3M
1	J1	IC & Component Sockets .05" 50 POS R/ANGLE	851-43-050-20-001000	Mill-Max
3	R1, R2, R3	RES, 10.0k ohm, 1%, 0.1W, 0603	CRCW060310K0FKEA	Vishay-Dale
2	R4, R5	RES, 845 ohm, 1%, 0.1W, 0603	CRCW060310K0FKEA	Yageo America
1	U2	IC COMPARATOR 1.8V W/REF SOT23-6	TLV3012AIDBVT	Texas Instruments
1	V+	Test Point, TH, Compact, Red	5005	Keystone

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3. User agrees that EVMs shall not be used as, or incorporated into, all or any part of a finished product.
4. User agrees and acknowledges that certain EVMs may not be designed or manufactured by TI.
5. User must read the user's guide and all other documentation accompanying EVMs, including without limitation any warning or restriction notices, prior to handling and/or using EVMs. Such notices contain important safety information related to, for example, temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.
6. User assumes all responsibility, obligation, and any corresponding liability for proper and safe handling and use of EVMs.
7. Should any EVM not meet the specifications indicated in the user's guide or other documentation accompanying such EVM, the EVM may be returned to TI within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY TI TO USER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. TI SHALL NOT BE LIABLE TO USER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RELATED TO THE HANDLING OR USE OF ANY EVM.
8. No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which EVMs might be or are used. TI currently deals with a variety of customers, and therefore TI's arrangement with the user is not exclusive. TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services with respect to the handling or use of EVMs.
9. User assumes sole responsibility to determine whether EVMs may be subject to any applicable federal, state, or local laws and regulatory requirements (including but not limited to U.S. Food and Drug Administration regulations, if applicable) related to its handling and use of EVMs and, if applicable, compliance in all respects with such laws and regulations.
10. User has sole responsibility to ensure the safety of any activities to be conducted by it and its employees, affiliates, contractors or designees, with respect to handling and using EVMs. Further, user is responsible to ensure that any interfaces (electronic and/or mechanical) between EVMs and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
11. User shall employ reasonable safeguards to ensure that user's use of EVMs will not result in any property damage, injury or death, even if EVMs should fail to perform as described or expected.
12. User shall be solely responsible for proper disposal and recycling of EVMs consistent with all applicable federal, state, and local requirements.

Certain Instructions. User shall operate EVMs within TI's recommended specifications and environmental considerations per the user's guide, accompanying documentation, and any other applicable requirements. Exceeding the specified ratings (including but not limited to input and output voltage, current, power, and environmental ranges) for EVMs may cause property damage, personal injury or death. If there are questions concerning these ratings, user should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the applicable EVM user's guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using EVMs' schematics located in the applicable EVM user's guide. When placing measurement probes near EVMs during normal operation, please be aware that EVMs may become very warm. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use EVMs.

Agreement to Defend, Indemnify and Hold Harmless. User agrees to defend, indemnify, and hold TI, its directors, officers, employees, agents, representatives, affiliates, licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of, or in connection with, any handling and/or use of EVMs. User's indemnity shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if EVMs fail to perform as described or expected.

Safety-Critical or Life-Critical Applications. If user intends to use EVMs in evaluations of safety critical applications (such as life support), and a failure of a TI product considered for purchase by user for use in user's product would reasonably be expected to cause severe personal injury or death such as devices which are classified as FDA Class III or similar classification, then user must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

RADIO FREQUENCY REGULATORY COMPLIANCE INFORMATION FOR EVALUATION MODULES

Texas Instruments Incorporated (TI) evaluation boards, kits, and/or modules (EVMs) and/or accompanying hardware that is marketed, sold, or loaned to users may or may not be subject to radio frequency regulations in specific countries.

General Statement for EVMs Not Including a Radio

For EVMs not including a radio and not subject to the U.S. Federal Communications Commission (FCC) or Industry Canada (IC) regulations, TI intends EVMs to be used only for engineering development, demonstration, or evaluation purposes. EVMs are not finished products typically fit for general consumer use. EVMs may nonetheless generate, use, or radiate radio frequency energy, but have not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or the ICES-003 rules. Operation of such EVMs may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: For EVMs including a radio, the radio included in such EVMs is intended for development and/or professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability in such EVMs and their development application(s) must comply with local laws governing radio spectrum allocation and power limits for such EVMs. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by TI unless user has obtained appropriate experimental and/or development licenses from local regulatory authorities, which is the sole responsibility of the user, including its acceptable authorization.

U.S. Federal Communications Commission Compliance

For EVMs Annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at its own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Industry Canada Compliance (English)

For EVMs Annotated as IC – INDUSTRY CANADA Compliant:

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs Including Radio Transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs Including Detachable Antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Canada Industry Canada Compliance (French)

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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Important Notice for Users of EVMs Considered “Radio Frequency Products” in Japan

EVMs entering Japan are NOT certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If user uses EVMs in Japan, user is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after user obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after user obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless user gives the same notice above to the transferee. Please note that if user does not follow the instructions above, user will be subject to penalties of Radio Law of Japan.

<http://www.tij.co.jp>

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In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

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