

## ***TSC2007EVM and TSC2007EVM-PDK User's Guide***

This user's guide describes the characteristics, operation, and use of the TSC2007EVM, both by itself and as part of the TSC2007EVM-PDK. This evaluation module (EVM) is a 4-wire touch screen controller EVM which also has auxiliary input and temperature measurement capabilities. A complete circuit description, schematic diagram, and bill of materials are included.

The following related documents are available through the Texas Instruments Web site at [www.ti.com](http://www.ti.com).

**Table 1. EVM-Compatible Device Data Sheets**

| DEVICE       | LITERATURE NUMBER       |
|--------------|-------------------------|
| TSC2007      | <a href="#">SBAS405</a> |
| TAS1020B     | <a href="#">SLES025</a> |
| REG1117-5    | <a href="#">SBVS001</a> |
| TPS767D318   | <a href="#">SLVS209</a> |
| SN74LVC125A  | <a href="#">SCAS290</a> |
| SN74LVC1G125 | <a href="#">SCES223</a> |
| SN74LVC1G07  | <a href="#">SCES296</a> |

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## 1 EVM Overview

### 1.1 Features

- Full-featured evaluation board for the TSC2007 4-wire resistive touch screen controller (TSC).
- Modular design for use with a variety of DSP and microcontroller interface boards.

The TSC2007EVM-PDK is a complete evaluation kit, which includes a USB-based motherboard and evaluation software for use with a personal computer running Microsoft Windows™ operating systems.

### 1.2 Introduction

The TSC2007EVM is in the Texas Instruments modular EVM form factor, which allows direct evaluation of the performance and operating characteristics of the TSC2007, and eases software development and system prototyping. This EVM is compatible with the 5-6K Interface Evaluation Module ([SLAU104](#)) from Texas Instruments and additional third-party boards such as the NI Speedy-33™ from National Instruments Corporation. ([www.ni.com](#))

The TSC2007EVM-PDK is a complete evaluation/demonstration kit, which includes a USB-based motherboard called the USB-MODEVM interface board and evaluation software for use with a personal computer running Microsoft Windows operating systems.

## 2 Analog Interface

For maximum flexibility, the TSC2007EVM is designed for easy interfacing to multiple analog sources. Samtec part numbers SSW-110-22-F-D-VS-K and TSM-110-01-T-DV-P provide a convenient 10-pin, dual-row header/socket combination at J1. This header/socket provides access to the analog input pins of the TSC. Consult Samtec at [www.samtec.com](#), or call 1-800-SAMTEC-9 for a variety of mating connector options.

**Table 2. Analog Interface Pinout**

| PIN NUMBER       | SIGNAL | DESCRIPTION                              |
|------------------|--------|------------------------------------------|
| J1.2             | X+     | Touch screen X+ electrode                |
| J1.4             | X-     | Touch screen X- electrode                |
| J1.6             | Y+     | Touch screen Y+ electrode                |
| J1.8             | Y-     | Touch screen Y- electrode                |
| J1.10            | Unused |                                          |
| J1.12            | AUX    | Auxiliary input, 0 V to VREF             |
| J1.14            | Unused |                                          |
| J1.16            | Unused |                                          |
| J1.18            | Unused |                                          |
| J1.20            | Unused |                                          |
| J1.15            | Unused |                                          |
| J1.1-J1.19 (odd) | AGND   | Analog ground connections (except J1.15) |

NI Speedy-33 is a trademark of Hyperception, Inc.

I<sup>2</sup>C is a trademark of Koninklijke Philips Electronics N.V., The Netherlands.

Windows is a trademark of Microsoft Corporation.

SPI is a trademark of Motorola, Inc.

### 3 Digital Interface

The TSC2007EVM is designed to easily interface with multiple control platforms. Samtec part numbers SSW-110-22-F-D-VS-K and TSM-110-01-T-DV-P provide a convenient 10-pin, dual-row header/socket combination at J2. This header/socket provides access to the digital control and serial data pins of the TSC. Consult Samtec at [www.samtec.com](http://www.samtec.com) or call 1-800-SAMTEC-9 for a variety of mating connector options.

**Table 3. Digital Interface Pinout**

| PIN NUMBER                     | SIGNAL | DESCRIPTION                        |
|--------------------------------|--------|------------------------------------|
| J2.15                          | PENIRQ | Pen Interrupt Output from TSC      |
| J2.16                          | SCL    | I <sup>2</sup> C™ bus serial clock |
| J2.4, J2.10, J2.18             | DGND   | Digital ground                     |
| J2.1-J2.19 (odd, except J2.15) | Unused |                                    |
| J2.20                          | SDA    | I <sup>2</sup> C bus data line     |

### 4 Power Supplies

J3 provides connection to the common power bus for the TSC2007EVM. Power is supplied on the pins listed in [Table 4](#).

**Table 4. Power Supply Pinout**

| SIGNAL | PIN NUMBER |    | SIGNAL |
|--------|------------|----|--------|
| Unused | 1          | 2  | Unused |
| Unused | 3          | 4  | Unused |
| DGND   | 5          | 6  | AGND   |
| +1.8VD | 7          | 8  | Unused |
| +3.3VD | 9          | 10 | Unused |

When power is supplied to J3, JMP1 allows for one of two different DC voltages to be selected as power for the TSC. See the schematic and PCB silkscreen for details.

The TSC2007EVM-PDK motherboard (the USB-MODEVM interface board) supplies power to J3 of the TSC2007EVM. Power for the motherboard is supplied either through its USB connection or via terminal blocks on the board.

#### 4.1 TSC Power

Power for the TSC2007 VCC can be supplied either from the +1.8VD terminal or from the +3.3VD terminal. JMP1 selects which of these voltages is routed to the TSC2007. When JMP1 is in the default factory condition (shunt on pins 2-3), power to the TSC comes from J3.9 (+3.3VD). When the shunt is installed on JMP1 pins 1-2, power comes from J3.7 (+1.8VD). Removing the shunt on JMP1, the user can connect any DC power supply between 1.2VD and 3.6VD to VCC by connecting the power to JMP1 pin 2.

**Table 5. Power Selection Options - JMP1**

| SHUNT ON PINS | VDD               | VOLTAGE FROM J3 PIN |
|---------------|-------------------|---------------------|
| 1-2           | +1.8VD            | 7                   |
| 2-3           | +3.3VD            | 9                   |
| Removed       | +1.2VD and +3.6VD | External            |

## 4.2 Stand-Alone Operation

When used as a stand-alone EVM, power can be applied to TP1, referenced to TP3.

### CAUTION

Verify that all power supplies are within the safe operating limits shown on the TSC2007 data sheet ([SBAS405](#)) before applying power to the EVM.

## 4.3 USB-MODEVM Interface Power

The USB-MODEVM interface board can be powered from several different sources:

- USB
- 6 VDC-10 VDC AC/DC external wall supply (not included)
- Laboratory power supply

When powered from the USB connection, JMP6 should have a shunt from pins 1-2 (this is the default factory configuration). When powered from 6 VDC-10 VDC, either through the J8 terminal block or J9 barrel jack, JMP6 should have a shunt installed on pins 2-3. If power is applied in any of these ways, onboard regulators generate the required supply voltages, and no further power supplies are necessary.

If laboratory supplies are used to provide the individual voltages required by the USB-MODEVM interface board, JMP6 should have no shunt installed. Voltages then are applied to J2 (+5VA), J3 (+5VD), J4 (+1.8VD), and J5 (+3.3VD). The +1.8VD and +3.3VD also can be generated on the board by the onboard regulators from the +5VD supply; to enable this supply, the switches on SW1 need to be set to enable the regulators by placing them in the ON position (lower position, looking at the board with text reading right-side up). If +1.8VD and +3.3VD are supplied externally, disable the onboard regulators by placing SW1 switches in the OFF position.

Each power supply voltage has an LED (D1-D7) which lights when the power supplies are active.

## 5 EVM Operation

The following section provides information on the analog input, digital control, and general operating conditions of the TSC2007EVM.

### 5.1 Analog Input

The analog input sources (touch screen and auxiliary input) can be applied directly to J1 (top or bottom side) or through signal-conditioning modules available for the modular EVM system.

### 5.2 Digital Control

The digital control signals can be applied directly to J2 (top or bottom side). The modular TSC2007EVM also can be connected directly to a DSP or microcontroller interface board, such as the USB-MODEVM interface board if purchased as part of the TSC2007EVM-PDK. See the product folder for the TSC2007 for a current list of compatible interface and/or accessory boards.

### 5.3 Default Jumper Locations

[Table 6](#) provides a list of jumpers found on the EVM and their factory default conditions.

**Table 6. List of Jumpers**

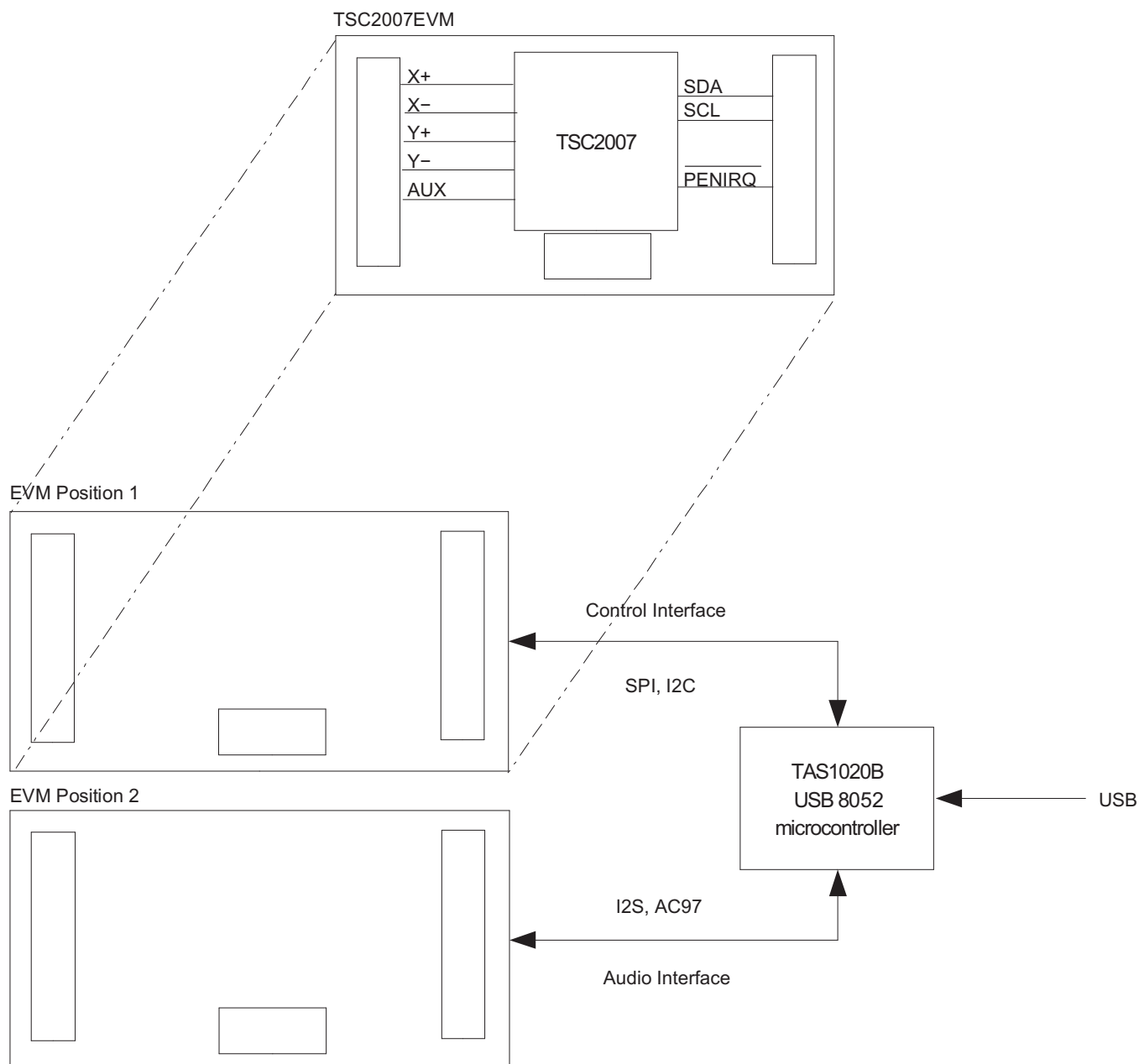
| JUMPER | SHUNT POSITION | JUMPER DESCRIPTION                                                                                                                                                        |
|--------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| JMP1   | 2-3            | Analog power select (default is +3.3VD)                                                                                                                                   |
| JMP2   | Closed         | EEPROM address select. When installed and used with the USB-MODEVM, firmware for the motherboard is executed from the EEPROM on the TSC2007EVM. This is the default mode. |

## 6 Kit Operation

The following section provides information on using the TSC2007EVM-PDK, including setup, program installation, and program usage.

### 6.1 TSC2007EVM-PDK Block Diagram

A block diagram of the TSC2007EVM-PDK is shown in [Figure 1](#). The evaluation kit consists of two circuit boards connected together. The motherboard is designated as the USB-MODEVM interface board; the daughtercard is the TSC2007EVM described previously in this manual.



**Figure 1. TSC2007EVM-PDK Block Diagram**

The USB-MODEVM interface board is intended to be used in USB mode, where control of the installed EVM is accomplished using the onboard USB controller device. However, provision is made for driving all the data buses (I<sup>2</sup>C, SPI™, and I<sup>2</sup>S/AC97) externally. The source of these signals is controlled by SW2 on the USB-MODEVM.

## 6.2 Quick Start

Before installing the TSC2007EVM board on top of the USB-MODEVM board, check SW2-1, SW2-2, and SW2-3 on the USB-MODEVM board to ensure that at least one of these three is OFF

Ensure that the TSC2007EVM is installed on the USB-MODEVM interface board. The TSC2007EVM should be installed in the topmost position, using J11, J12, and J13 on the USB-MODEVM.

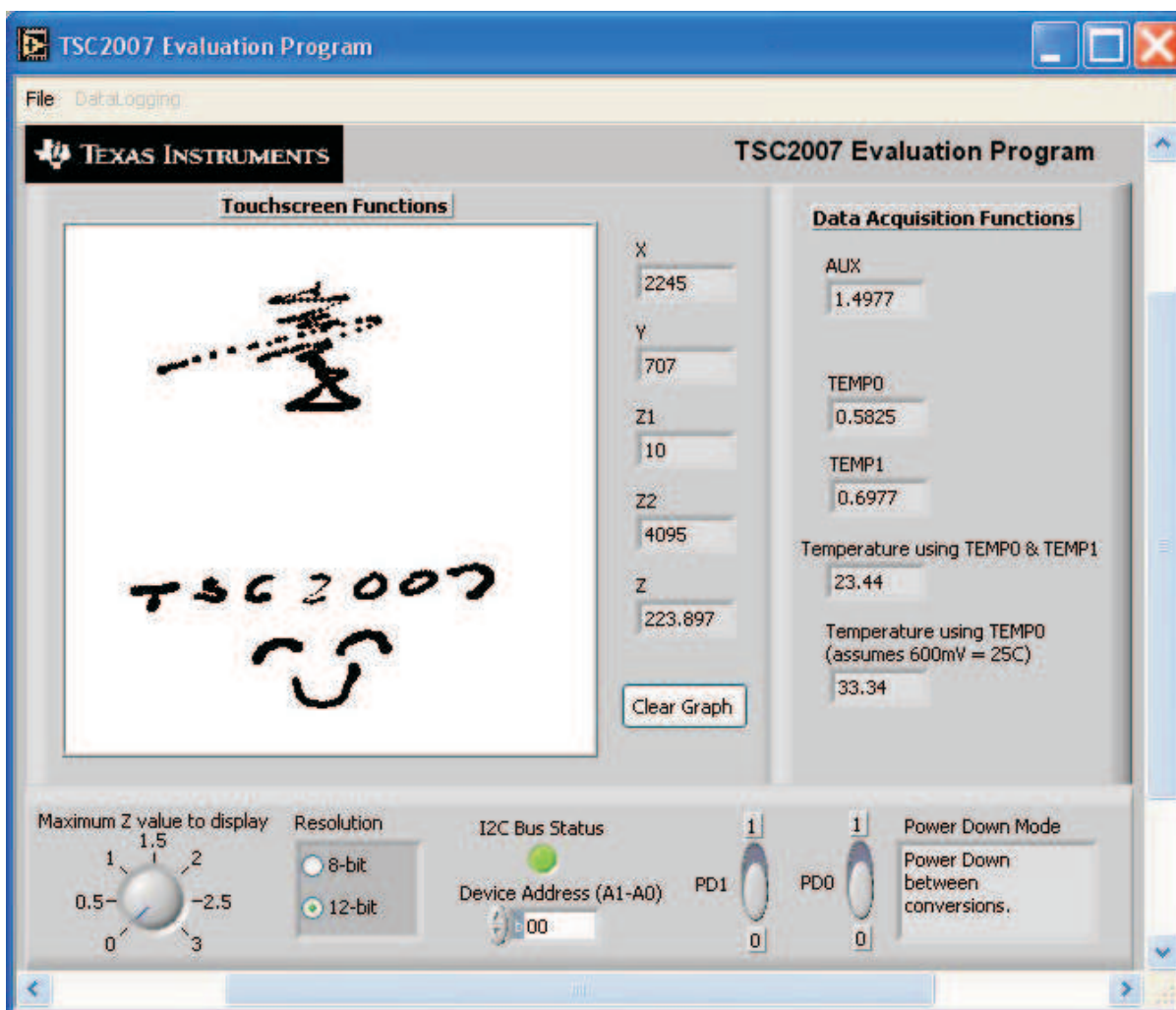
Place the CD-ROM into your PC CD-ROM drive. Locate the Setup program on the disk, and run it. The Setup program will install the TSC2007 Evaluation software on your PC.

Accept the license agreement, and continue the installation.

When the installation completes, click *Finish* on the TSC2007EVM installer window. You may be prompted to restart your computer.

When installation is complete, attach a USB cable from your PC to the USB-MODEVM interface board. As configured at the factory, the board is powered from the USB interface; so, the power indicator LEDs on the USB-MODEVM should light. Once this occurs, launch the TSC2007 evaluation software on your PC. It is suggested that users read the *readme\_install.txt* file for up-to-date, step-by-step instructions.

The software should automatically find the TSC2007EVM, and a screen similar to the one shown in [Figure 2](#) should appear.



**Figure 2. Default Software Screen**

In order to use the touch screen features, a user needs to connect a 4-wire resistive touch screen to J1 of the TSC2007EVM, as described previously.

### 6.3 USB-MODEVM Interface Board

The simple diagram shown in [Figure 1](#) shows only the basic features of the USB-MODEVM interface board. The board is built around a TAS1020B streaming audio USB controller with an 8051-based core. The board features two positions for modular EVMs, or one double-wide serial modular EVM may be installed.

For use with the TSC2007, the TSC2007EVM is installed in the topmost EVM slot, which connects the TSC2007 digital control interface to the I<sup>2</sup>C port, realized using the TAS1020B. Because the TSC2007 has no audio features, the lower EVM slot, which is connected to the TAS1020B digital audio interface, is not used.

As configured from the factory, the board is ready to use with the TSC2007EVM except for SW2, in which case at least one of SW2-1, SW2-2, and SW2-3 must be set to OFF.

### 6.4 Program Description

After the TSC2007EVM-PDK software installation (described in [Section 6.2](#)), evaluation and development with the TSC2007 can begin.

#### 6.4.1 Touch Screen Functions Panel

The touch screen box in this panel is updated when a touch is detected on the touch screen. As the touch screen is drawn on, the motion on the touch screen is translated into pixels on this box. The software takes X, Y, and Z readings which are shown to the right of the touch screen box. As the touch pressure is increased, the pixel size increases; a lighter touch results in smaller pixel sizes.

The Z-value displayed is not what is described in the TSC2007 data sheet, because in the data sheet equation, it is assumed that the sheet resistance of the touch screen being used is known. The value used in this program is calculated by Equation 2 of the TSC2007 data sheet, but without multiplying it by the  $R_{X-plate}$  resistance. This value ranges from 0 to 3, and larger, with larger numbers representing a more forceful press on the screen. Using the **Maximum Z Value to Display** knob, you can set a threshold so that the program does not display lightly pressed points. This threshold setting helps to eliminate display of spurious points that may result from touch screen mechanical bouncing.

The display can be cleared by pressing the **Clear Graph** button on the screen.

#### 6.4.2 Data Acquisition Functions Panel

The TSC2007 has provision for measuring one auxiliary input voltages (AUX1) and temperature. This panel displays the measured values for these parameters. Measurements are updated only when the touch screen is not being pressed.

Temperature is displayed using both methods described in the TSC2007 data sheet. Using the TEMP0 and TEMP1 measurements, a temperature reading with 2°C resolution and accuracy is achieved. Using only the TEMP0 measurement, a reading with 0.3°C resolution is possible, but this option requires knowing the TEMP0 value at +25°C; this would normally be a calibration that the user would perform. This program assumes that TEMP0 = 600 mV at +25°C.

#### 6.4.3 Configuration Panel

The TSC2007 can be configured to operate in 8-bit or 12-bit resolution modes. Control over the mode used is selected in this panel.

In the middle of this panel is an indicator light that shows the I<sup>2</sup>C Bus Status. If the TSC2007 is acknowledging the address sent, the light is green; if the TSC2007 cannot acknowledge, the light is red. The address to which the TSC2007 is set is shown in binary format in the box labeled *Device Address A1-A0*. The address set here should be "00" when using the TSC2007EVM. Even though the TSC2007 has two pins, A0 and A1, for users to select four different I<sup>2</sup>C addresses, the TSC2007EVM has only a fixed address 1001000b, where A0=A1="0", because both A0 and A1 are tied to ground. See the TSC2007EVM schematic provided in this document.



The two power-down bits of the TSC2007 can be set from this panel as well. A brief description of the mode selected is shown on the screen when setting these bits; see Table 3 (*Command Byte Definitions*) of the TSC2007 data sheet ([SBAS405](#)) for details on what these bits do.

#### 6.4.4 Datalogging

The software can record the data it takes from the TSC2007 to a tab-delimited file, suitable for importing into spreadsheets. To do this, first go into the *File* menu, and select *Log Data to File...*, which opens a file-select window and allows you to specify a file to which to write the data. At the same time, this enables the Datalogging menu.

When ready to begin recording data to a file, select *Datalogging* → *Start Logging*. Data is written to the file until *Datalogging* → *Stop Logging* is selected. When the screen is not touched, the AUX and TEMP values are written to the file, and the X, Y, Z1, and Z2 parameters are written to the file with values of **9999**, to indicate that they are not updated. When the screen is touched, the X, Y, Z1, and Z2 parameters are written while the AUX and TEMP values are written to the file as **9999**. Because the program constantly updates at a rate of about 400 readings per second, datalog files can quickly grow large; therefore, log only that data which is necessary.

The format of the data file has the first column as the time in milliseconds (which is just a timer in the program; it can arbitrarily start at any number), then X, Y, Z1, Z2, AUX, TEMP0, and TEMP1 columns. Every new reading is a new row in the file.

## 7 EVM Bill of Materials

Table 7 and Table 8 contain a complete bill of materials for the modular TSC2007EVM evaluation board and the USB-MODEVM interface board, respectively (included only in the TSC2007EVM-PDK).

**Table 7. TSC2007EVM Bill of Materials**

| Reference Designator | Description                                    | Manufacturer         | Manufacturer's Part Number |
|----------------------|------------------------------------------------|----------------------|----------------------------|
| R1                   | 100Ω 1/8W 5% Chip Resistor                     | Panasonic            | ERJ-6GEYJ101V              |
| R2, R3               | 2.7kΩ 1/10W 5% Chip Resistor                   | Panasonic            | ERJ-3GEYJ272V              |
| R4                   | 20kΩ 1/10W 5% Chip Resistor                    | Panasonic            | ERJ-3GEYJ272V              |
| C1, C3, C8           | 0.1μF 16V Ceramic Chip Capacitor, +/- 10%, X7R | TDK                  | C1608X7R1C105K             |
| C2                   | 10μF 16V Ceramic Chip Capacitor, +/- 20%, X5R  | TDK                  | C3216X5R1C106M             |
| C4-C7                | Ceramic Chip Capacitor - Not installed         |                      |                            |
| U1                   | I <sup>2</sup> C Touch Screen Controller       | Texas Instruments    | TSC2007IZZ                 |
| U2                   | 64K I <sup>2</sup> C EEPROM                    | MicroChip            | 24AA64-I/SN                |
|                      | TSC2007EVM PCB                                 | Texas Instruments    | 6486822                    |
| J1A, J2A             | 20-pin SMT plug                                | Samtec               | TSM-110-01-L-DV-P          |
| J1B, J2B             | 20-pin SMT socket                              | Samtec               | SSW-110-22-F-D-VS-K        |
| J3A                  | 10-pin SMT plug                                | Samtec               | TSM-105-01-L-DV-P          |
| J3B                  | 10-pin SMT socket                              | Samtec               | SSW-105-22-F-D-VS-K        |
| JMP2                 | 2-position jumper , 0 .1" spacing              | Samtec               | TSW-102-07-L-S             |
| JMP1                 | 3-position jumper , 0 .1" spacing              | Samtec               | TSW-103-07-L-S             |
| TP1                  | Miniature test point terminal                  | Keystone Electronics | 5000                       |
| TP2                  | Miniature test point terminal                  | Keystone Electronics | 5001                       |
| TP4, TP5, TP6, TP7   | Miniature test point terminal                  | Keystone Electronics | 5002                       |
| TP8                  | Miniature test point terminal                  | Keystone Electronics | 5004                       |
| TP9, TP10, TP11      | Miniature test point terminal                  | Keystone Electronics | 5003                       |
|                      | Header shorting block                          | Samtec               | SNT-100-BK-G-H             |

**Table 8. USB-MODEVM Bill of Materials**

| Reference Designator                                 | Description                                  | Manufacturer                | Manufacturer's Part Number |
|------------------------------------------------------|----------------------------------------------|-----------------------------|----------------------------|
| R4                                                   | 10Ω 1/10W 5% Chip Resistor                   | Panasonic                   | ERJ-3GEYJ100V              |
| R10, R11                                             | 27.4Ω 1/16W 1% Chip Resistor                 | Panasonic                   | ERJ-3EKF27R4V              |
| R20                                                  | 75Ω 1/4W 1% Chip Resistor                    | Panasonic                   | ERJ-14NF75R0U              |
| R19                                                  | 220Ω 1/10W 5% Chip Resistor                  | Panasonic                   | ERJ-3GEYJ221V              |
| R14, R21, R22                                        | 390Ω 1/10W 5% Chip Resistor                  | Panasonic                   | ERJ-3GEYJ391V              |
| R13                                                  | 649Ω 1/16W 1% Chip Resistor                  | Panasonic                   | ERJ-3EKF6490V              |
| R9                                                   | 1.5KΩ 1/10W 5% Chip Resistor                 | Panasonic                   | ERJ-3GEYJ152V              |
| R1, R2, R3, R5, R6, R7, R8                           | 2.7KΩ 1/10W 5% Chip Resistor                 | Panasonic                   | ERJ-3GEYJ272V              |
| R12                                                  | 3.09KΩ 1/16W 1% Chip Resistor                | Panasonic                   | ERJ-3EKF3091V              |
| R15, R16                                             | 10KΩ 1/10W 5% Chip Resistor                  | Panasonic                   | ERJ-3GEYJ103V              |
| R17, R18                                             | 100KΩ 1/10W 5% Chip Resistor                 | Panasonic                   | ERJ-3GEYJ104V              |
| RA1                                                  | 10KΩ 1/8W Octal Isolated Resistor Array      | CTS Corporation             | 742C163103JTR              |
| C18, C19                                             | 33pF 50V Ceramic Chip Capacitor, ±5%, NPO    | TDK                         | C1608C0G1H330J             |
| C13, C14                                             | 47pF 50V Ceramic Chip Capacitor, ±5%, NPO    | TDK                         | C1608C0G1H470J             |
| C20                                                  | 100pF 50V Ceramic Chip Capacitor, ±5%, NPO   | TDK                         | C1608C0G1H101J             |
| C21                                                  | 1000pF 50V Ceramic Chip Capacitor, ±5%, NPO  | TDK                         | C1608C0G1H102J             |
| C15                                                  | 0.1μF 16V Ceramic Chip Capacitor, ±10%, X7R  | TDK                         | C1608X7R1C104K             |
| C16, C17                                             | 0.33μF 16V Ceramic Chip Capacitor, ±20%, Y5V | TDK                         | C1608X5R1C334K             |
| C9, C10, C11, C12, C22, C23, C24, C25, C26, C27, C28 | 1μF 6.3V Ceramic Chip Capacitor, ±10%, X5R   | TDK                         | C1608X5R0J105K             |
| C1, C2, C3, C4, C5, C6, C7, C8                       | 10μF 6.3V Ceramic Chip Capacitor, ±10%, X5R  | TDK                         | C3216X5R0J106K             |
| D1                                                   | 50V, 1A, Diode MELF SMD                      | Micro Commercial Components | DL4001                     |
| D2                                                   | Yellow Light Emitting Diode                  | Lumex                       | SML-LX0603YW-TR            |
| D3, D4, D6, D7                                       | Green Light Emitting Diode                   | Lumex                       | SML-LX0603GW-TR            |
| D5                                                   | Red Light Emitting Diode                     | Lumex                       | SML-LX0603IW-TR            |
| Q1, Q2                                               | N-Channel MOSFET                             | Zetex                       | ZXMN6A07F                  |
| X1                                                   | 6MHz Crystal SMD                             | Epson                       | MA-505 6.000M-C0           |
| U8                                                   | USB Streaming Controller                     | Texas Instruments           | TAS1020BPFB                |
| U2                                                   | 5V LDO Regulator                             | Texas Instruments           | REG1117-5                  |
| U9                                                   | 3.3V/1.8V Dual Output LDO Regulator          | Texas Instruments           | TPS767D318PWP              |
| U3, U4                                               | Quad, Tri-State Buffers                      | Texas Instruments           | SN74LVC125APW              |
| U5, U6, U7                                           | Single IC Buffer Driver with Open Drain o/p  | Texas Instruments           | SN74LVC1G07DBVR            |
| U10                                                  | Single Tri-State Buffer                      | Texas Instruments           | SN74LVC1G125DBVR           |
| U1                                                   | 64K 2-Wire Serial EEPROM I <sup>2</sup> C    | Microchip                   | 24LC64I/SN                 |
|                                                      | USB-MODEVM PCB                               | Texas Instruments           | 6463995                    |

**Table 8. USB-MODEVM Bill of Materials (continued)**

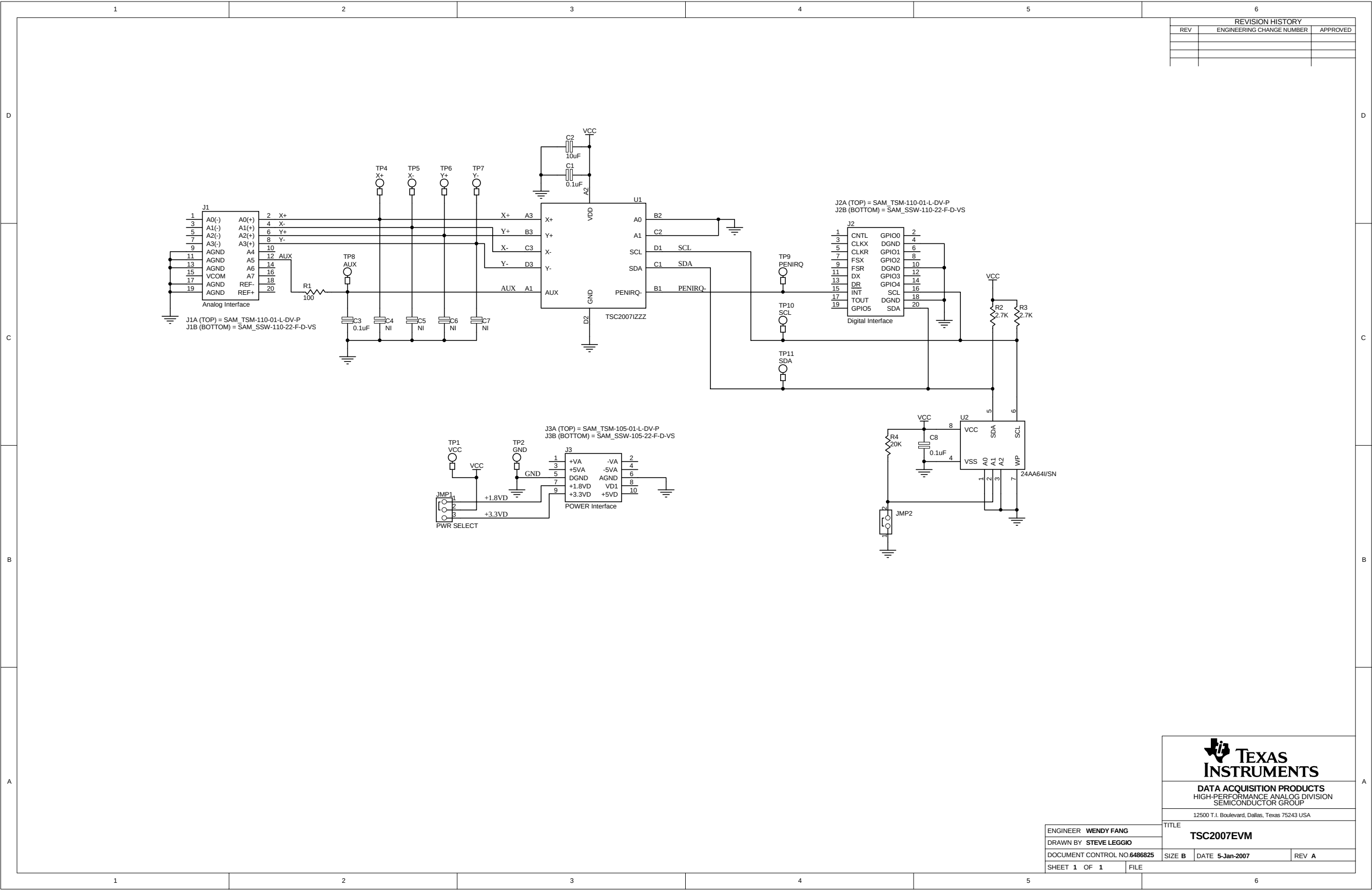
| Reference Designator                          | Description                              | Manufacturer         | Manufacturer's Part Number |
|-----------------------------------------------|------------------------------------------|----------------------|----------------------------|
| TP1, TP2, TP3, TP4, TP5, TP6, TP9, TP10, TP11 | Miniature test point terminal            | Keystone Electronics | 5000                       |
| TP7, TP8                                      | Multipurpose test point terminal         | Keystone Electronics | 5011                       |
| J7                                            | USB Type B Slave Connector Thru-Hole     | Mill-Max             | 897-30-004-90-000000       |
| J1, J2, J3, J4, J5, J8                        | 2-position terminal block                | On Shore Technology  | ED555/2DS                  |
| J9                                            | 2.5mm power connector                    | CUI Stack            | PJ-102B                    |
| J10                                           | BNC connector, female, PC mount          | AMP/Tyco             | 414305-1                   |
| J11A, J12A, J21A, J22A                        | 20-pin SMT plug                          | Samtec               | TSM-110-01-L-DV-P          |
| J11B, J12B, J21B, J22B                        | 20-pin SMT socket                        | Samtec               | SSW-110-22-F-D-VS-K        |
| J13A, J23A                                    | 10-pin SMT plug                          | Samtec               | TSM-105-01-L-DV-P          |
| J13B, J23B                                    | 10-pin SMT socket                        | Samtec               | SSW-105-22-F-D-VS-K        |
| J6                                            | 4-pin double row header (2x2) 0.1"       | Samtec               | TSW-102-07-L-D             |
| J14, J15                                      | 12-pin double row header (2x6) 0.1"      | Samtec               | TSW-106-07-L-D             |
| JMP1-JMP4                                     | 2-position jumper, 0.1" spacing          | Samtec               | TSW-102-07-L-S             |
| JMP8-JMP14                                    | 2-position jumper, 0.1" spacing          | Samtec               | TSW-102-07-L-S             |
| JMP5, JMP6                                    | 3-position jumper, 0.1" spacing          | Samtec               | TSW-103-07-L-S             |
| JMP7                                          | 3-position dual row jumper, 0.1" spacing | Samtec               | TSW-103-07-L-D             |
| SW1                                           | SMT, half-pitch 2-position switch        | C&K Division, ITT    | TDA02H0SK1                 |
| SW2                                           | SMT, half-pitch 8-position switch        | C&K Division, ITT    | TDA08H0SK1                 |
|                                               | Jumper plug                              | Samtec               | SNT-100-BK-T               |

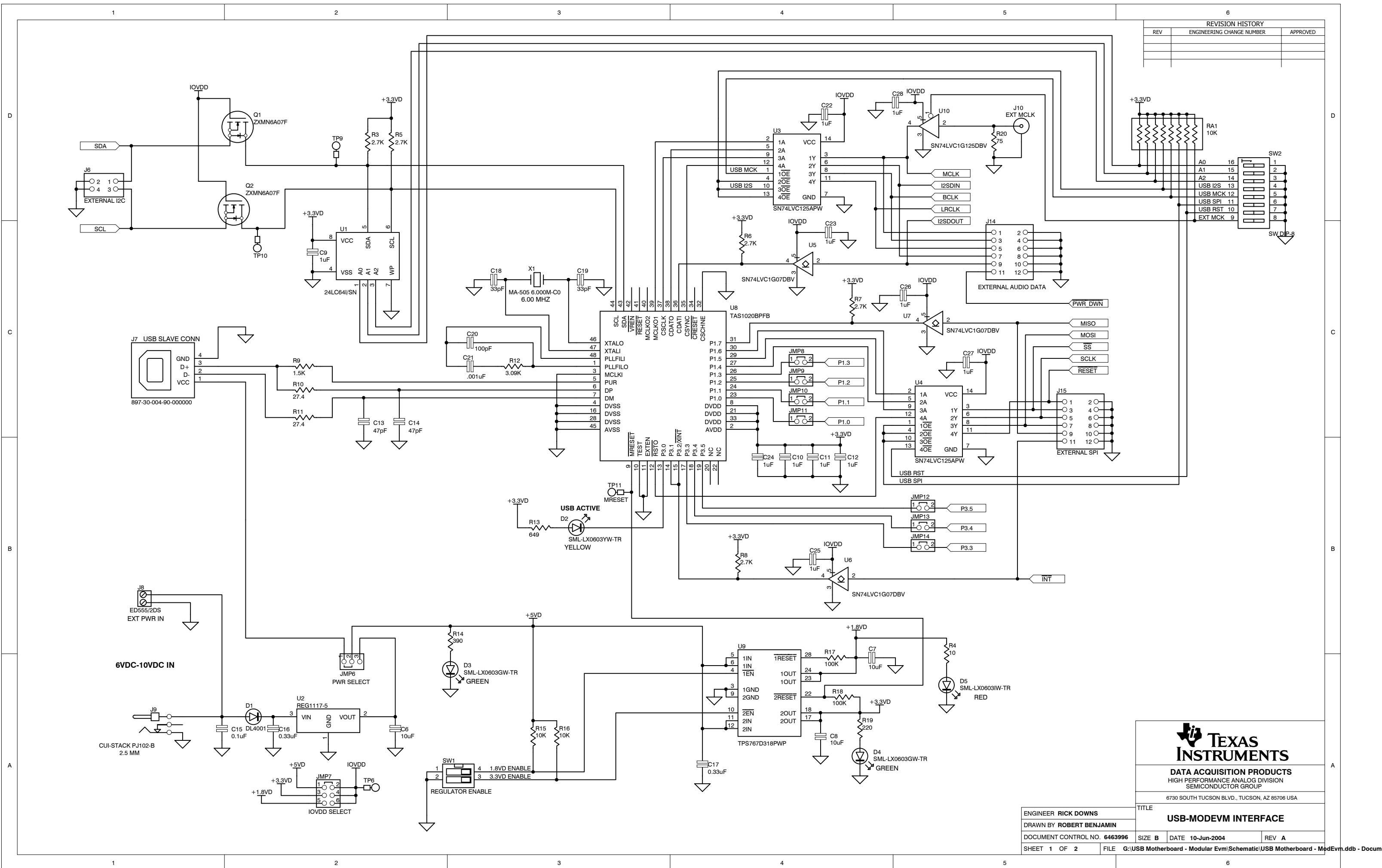
## 8 TSC2007EVM Schematic

The schematic diagram is provided as a reference.

## 9 USB-MODEVM Schematic

The schematic diagram is provided as a reference.





| REVISION HISTORY |                           |          |
|------------------|---------------------------|----------|
| REV              | ENGINEERING CHANGE NUMBER | APPROVED |
|                  |                           |          |
|                  |                           |          |
|                  |                           |          |

D

C

B

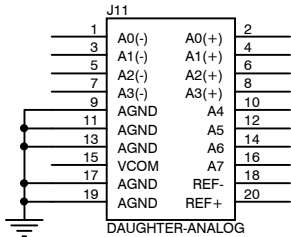
A

D

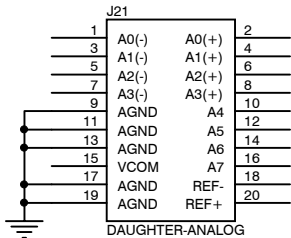
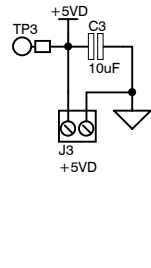
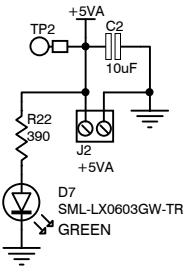
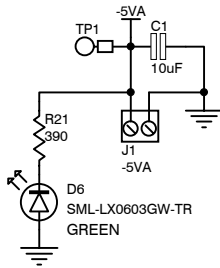
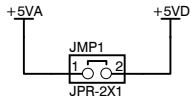
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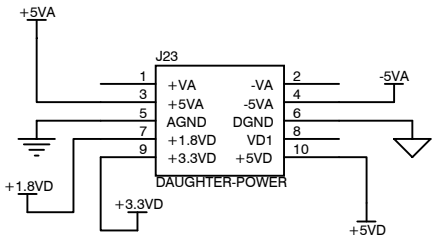
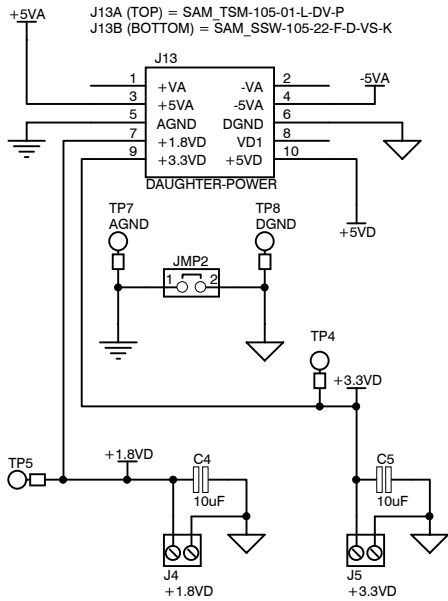
A



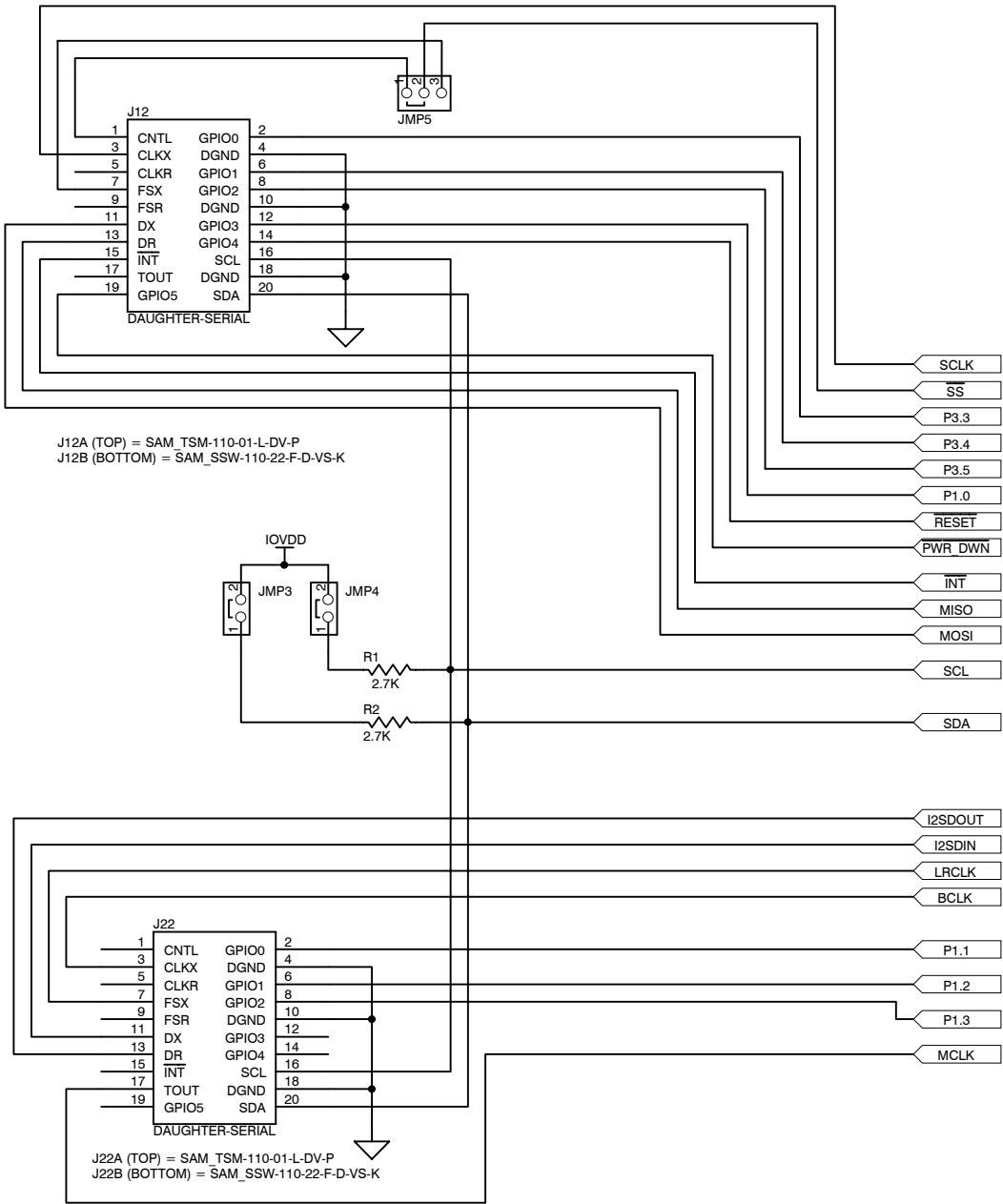
J11A (TOP) = SAM\_TSM-110-01-L-DV-P  
J11B (BOTTOM) = SAM\_SSW-110-22-F-D-VS-K



J21A (TOP) = SAM\_TSM-110-01-L-DV-P  
J21B (BOTTOM) = SAM\_SSW-110-22-F-D-VS-K



J23A (TOP) = SAM\_TSM-105-01-L-DV-P  
J23B (BOTTOM) = SAM\_SSW-105-22-F-D-VS-K



J22A (TOP) = SAM\_TSM-110-01-L-DV-P  
J22B (BOTTOM) = SAM\_SSW-110-22-F-D-VS-K



DATA ACQUISITION PRODUCTS  
HIGH-PERFORMANCE ANALOG DIVISION  
SEMICONDUCTOR GROUP

6730 SOUTH TUCSON BLVD., TUCSON, AZ 85706 USA

TITLE

USB-MODEVM INTERFACE

ENGINEER RICK DOWNS

DRAWN BY ROBERT BENJAMIN

DOCUMENT CONTROL NO. 6463996

SHEET 2 OF 2

SIZE B

DATE 10-Jun-2004

REV A

FILE G:\USB Motherboard - Modular Evm\Schematic\USB Motherboard - ModEvm.ddb - Document

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It is important to operate this EVM within the input voltage range of 3.3 V to 5 V and the output voltage range of 0 V to 5 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the 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 30°C. The EVM is designed to operate properly with certain components above 85°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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| Military           | <a href="http://www.ti.com/military">www.ti.com/military</a>             |
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| Security           | <a href="http://www.ti.com/security">www.ti.com/security</a>             |
| Telephony          | <a href="http://www.ti.com/telephony">www.ti.com/telephony</a>           |
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