TSC2003EVM and TSC2003EVM-PDK User's Guide

This user's guide describes the characteristics, operation, and use of the TSC2003EVM, both by itself and as part of the TSC2003EVM-PDK. This evaluation module (EVM) is a 4-wire touch screen controller EVM which also has auxiliary inputs and battery 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.

Table 1. EVM-Compatible Device Data Sheets

DEVICE	LITERATURE NUMBER
TSC2003	SBAS162
TAS1020B	SLES025
REG1117-5	SBVS001
TPS767D318	SLVS209
SN74LVC125A	SCAS290
SN74LVC1G125	SCES223
SN74LVC1G07	SCES296

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1 EVM Overview

1.1 Features

- Full-featured evaluation board for the TSC2003 4-wire resistive touch screen controller (TSC).
- Modular design for use with a variety of DSP and microcontroller interface boards.

The TSC2003EVM-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 TSC2003EVM is in Texas Instruments' modular EVM form factor, which allows direct evaluation of the performance and operating characteristics of the TSC2003, 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 HPA449 demonstration board from SoftBaugh, Inc. (www.softbaugh.com) and the Speedy33™ from Hyperception, Inc. (www.hyperception.com)

The TSC2003EVM-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 TSC2003EVM 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 Pin Out

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	VBAT1	Battery Input, 0V to 6V
J1.12	AUX1	Auxiliary Input, 0V to VREF
J1.14	VBAT2	Battery Input, 0V to 6V
J1.16	AUX2	Auxiliary Input, 0V to VREF
J1.18	REF(-)	Tied to analog ground
J1.20	REF(+)	External reference Source Input (2.5V NOM)
J1.15	Unused	
J1.1-J1.19 (odd)	AGND	Analog ground connections (except J1.15)

Speedy33 is a trademark of Hyperception, Inc.
I^2C 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.
WinZip is a trademark of WinZip Computing, Inc..

3 Digital Interface

The TSC2003EVM 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 or call 1-800-SAMTEC-9 for a variety of mating connector options.

Table 3. Digital Interface Pin Out

PIN NUMBER	SIGNAL	DESCRIPTION
J2.15	$\overline{\text{PENIRQ}}$	Pen Interrupt Output from TSC
J2.16	SCL	I²C™ bus serial clock
J2.4, J2.10, J2.18	DGND	Digital ground
J2.1-J2.19 (odd, except J2.15)	Unused	
J2.20	SDA	I²C bus data line

4 Power Supplies

J3 provides connection to the common power bus for the TSC2003EVM. Power is supplied on the pins listed in Table 4.

Table 4. Power Supply Pin Out

SIGNAL	PIN NUMBER		SIGNAL
Unused	1	2	Unused
Unused	3	4	Unused
DGND	5	6	AGND
Unused	7	8	+VD1
+3.3VD	9	10	+5VD

When power is supplied to J3, JMP5 allows for one of three different DC voltages to be selected as power for the TSC. See the schematic and PCB silkscreen for details.

The TSC2003EVM-PDK motherboard (the USB-MODEVM Interface board) supplies power to J3 of the TSC2003EVM. 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 TSC2003 VCC can be supplied either from the +5VD terminal or from the +3.3VD terminal. JMP5 selects which of these voltages is routed to the TSC2003. When JMP5 is in the default factory condition (shunt on pins 3-4), power to the TSC comes from J3.9 (+3.3VD). When the shunt is installed on JMP4 pins 5-6, power comes from J3.10 (+5VD). A shunt on JMP4 pins 1-2 connects power to J3.8, an unspecified voltage level that the user may supply.

Table 5. Power Selection Options - JMP5

SHUNT ON PINS	VDD	VOLTAGE FROM J3 PIN
1-2	+VD1	8
3-4	+3.3VD	9
5-6	+5VD	10

4.2 Stand-Alone Operation

When used as a stand-alone EVM, power can be applied to TP2, referenced to TP1.

CAUTION
Verify that all power supplies are within the safe operating limits shown on the TSC2003 data sheet 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
- 6VDC-10VDC AC/DC external wall supply (not included)
- Lab 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 6V-10VDC, 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 lab supplies are used to provide the individual voltages required by the USB-MODEVM Interface, JMP6 should have no shunt installed. Voltages are then applied to J2 (+5VA), J3 (+5VD), J4 (+1.8VD), and J5 (+3.3VD). The +1.8VD and +3.3VD can also 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 will light when the power supplies are active.

4.4 Reference Voltage

The TSC2003 has an internal voltage reference. An external reference may be supplied through pin 20 of J1 on the TSC2003EVM, referenced to analog ground (pin 18 of J1 on the TSC2003EVM). JMP1 must be installed in order to route this external reference voltage to the TSC2003.

CAUTION
Verify that the external reference voltage is within the safe operating limits shown on the TSC2003 data sheet before applying power to the EVM. Also, program the TSC2003 to use an external reference, if one is used.

5 EVM Operation

The following section provides information on the analog input, digital control, and general operating conditions of the TSC2003EVM.

5.1 Analog Input

The analog input sources (touch screen, auxiliary inputs, and battery inputs) 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 TSC2003EVM can also be connected directly to a DSP or microcontroller interface board, such as the HPA449, or to the USB-MODEVM Interface board if purchased as part of the TSC2003EVM-PDK. See the product folder for the EVM or the TSC2003 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	OPEN	Connects External reference to TSC2003 (default is disconnected, using internal TSC2003 reference)
JMP2	CLOSED	EEPROM Address Select - when installed and used with the USB-MODEVM, firmware for the motherboard is executed from the EEPROM on the TSC2003EVM. This is the default mode.
JMP3	CLOSED	Sets TSC2003 I^2C address bit A0. Installed A0=0, uninstalled A0=1. Default is jumper installed.
JMP4	CLOSED	Sets TSC2003 I^2C address bit A1. Installed A1=0, uninstalled A1=1. Default is jumper installed.
JMP5	3-4	Analog Power Select (default is +3.3VD)
JMP6	CLOSED	Connects analog ground (AGND) to digital ground (DGND). Default is connected.

6 Kit Operation

The following section provides information on using the TSC2003EVM-PDK, including setup, program installation, and program usage.

6.1 TSC2003EVM-PDK Block Diagram

A block diagram of the TSC2003EVM-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, while the daughtercard is the TSC2003EVM described previously in this manual.

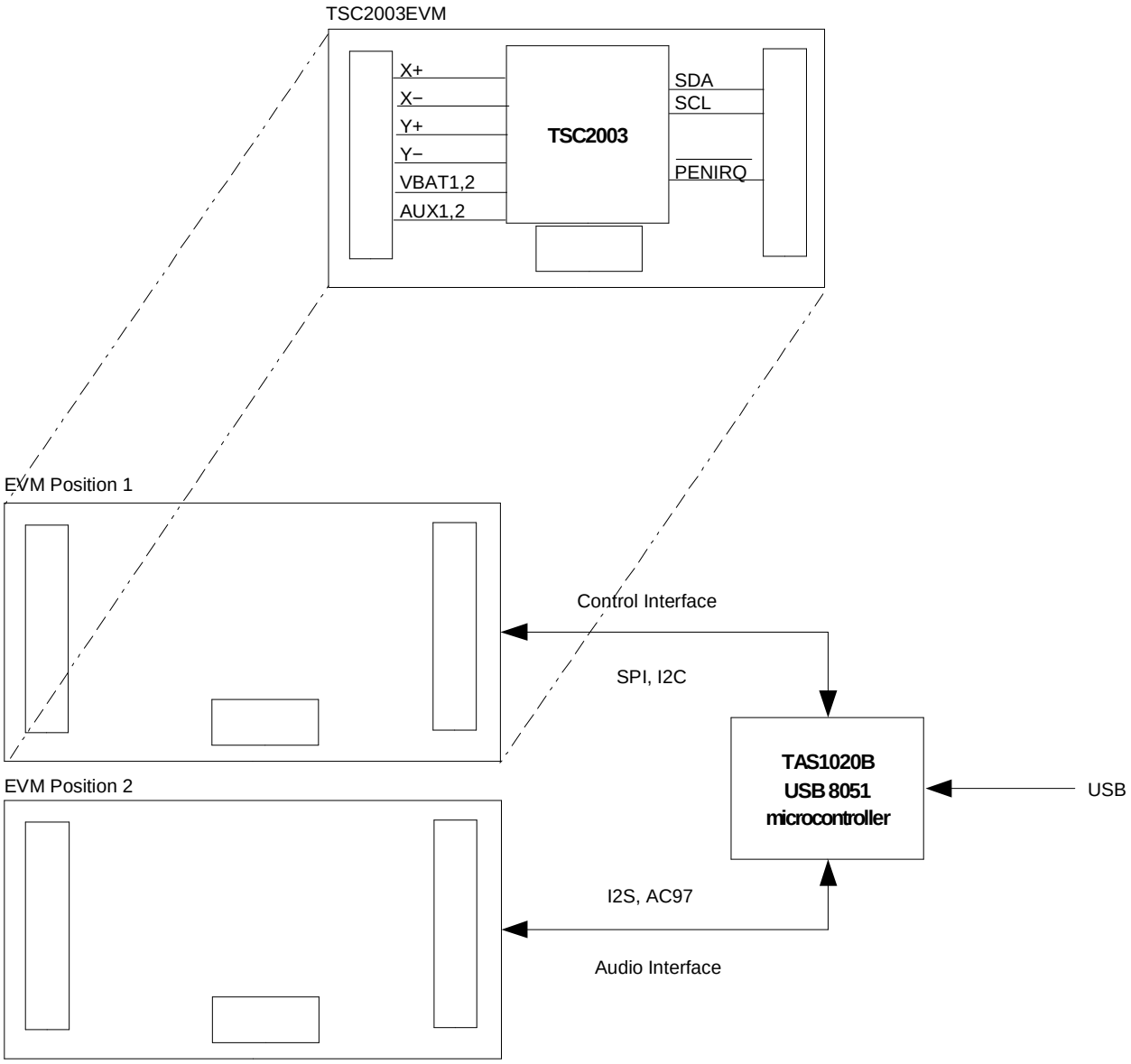


Figure 1. TSC2003EVM-PDK Block Diagram

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. Provision is made, however, for driving all the data buses (I^2C, SPI™, I^2S/AC97) externally. The source of these signals is controlled by SW2 on the USB-MODEVM.

6.2 Quick Start

Ensure that the TSC2003EVM is installed on the USB-MODEVM Interface board. The TSC2003EVM 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 TSC2003 Evaluation software on your PC.

After the main program is installed, a dialog box appears with instructions for installing NI-VISA 3.2 Runtime, a self-extracting archive. Click *OK* to proceed. A WinZip™ dialog appears. Click *Unzip*, and the archive extracts itself and automatically runs the NI-VISA 3.2 Runtime installer.

Follow the instructions in the NI-VISA 3.2 Runtime Installer. When prompted for which features to install, do the following:

1. Click on the disk icon next to NI-VISA 3.2
2. Select, ***Do not install this feature***.
3. Click on the disk icon next to *USB*.
4. Select the option which installs this feature.
5. Click *Next*.

Accept the license agreement, and continue the installation.

When the installation completes, click *Finish* on the TSC2003EVM 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 will be powered from the USB interface, so the power indicator LEDs on the USB-MODEVM should light. Once this occurs, launch the TSC2003 Evaluation software on your PC.

The software should automatically find the TSC2003EVM, and a screen similar to the one shown in Figure 2 should appear.

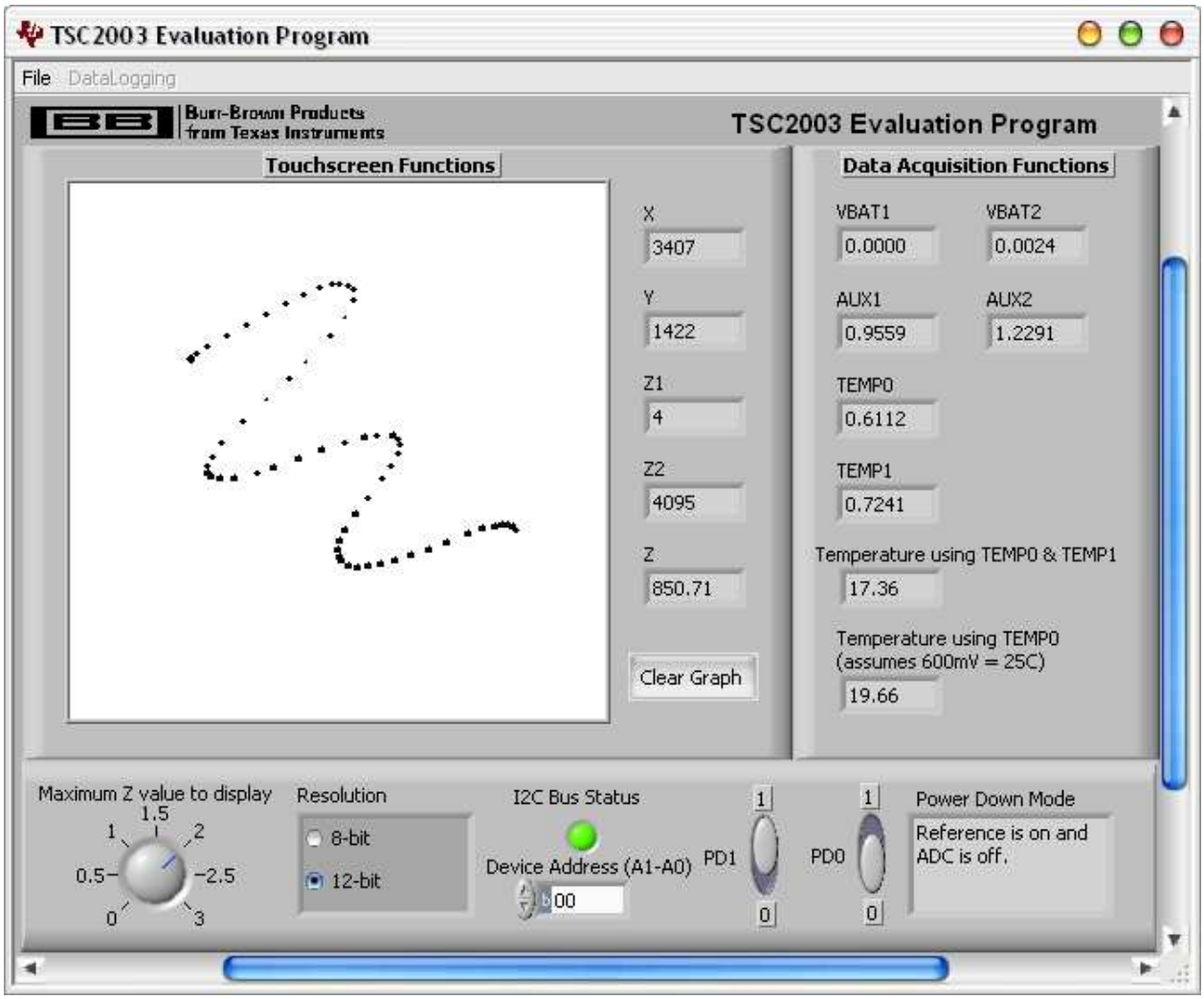


Figure 2. Default Software Screen

In order to use the touch screen features, a 4-wire resistive touch screen will need to be connected to J1 of the TSC2003EVM, as described earlier.

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 TSC2003, the TSC2003EVM is installed in the topmost EVM slot, which connects the TSC2003 digital control interface to the I^2C port realized using the TAS1020B. Since the TSC2003 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 TSC2003EVM. However, if external SPI control is desired, the signals may be applied to J15, as long as the SW2 is set so that USB SPI control is disabled. To view all the functions and configuration options available on this board, see the USB-MODEVM Interface Board schematic in Section 9.

6.4 Program Description

After the TSC2003EVM-PDK software installation (described in Section 6.2), evaluation and development with the TSC2003 can begin.

6.4.1 Touch Screen Functions Panel

The touch screen box in this panel will be updated when a touch is detected on the touch screen. As the touch screen is drawn upon, the motion on the touch screen will be 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 TSC2003 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 TSC2003 data sheet, but without multiplying it by the $R_{X\text{-plate}}$ resistance. This value ranges from 0 to 3, and larger, with smaller 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 TSC2003 has provision for measuring two battery voltages (VBAT1 and VBAT2), two auxiliary input voltages (AUX1 and AUX2), 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 TSC2003 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 = 600mV at +25°C.

6.4.3 Configuration Panel

The TSC2003 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^2C Bus Status. If the TSC2003 is acknowledging the address sent, the light is green; if the TSC2003 cannot acknowledge, the light is red. The address that the TSC2003 is set to is shown in binary format in the box labeled, *Device Address A1-A0*. The address set here should correspond to the bit settings determined by JMP3 and JMP4 on the TSC2003EVM.

The two power-down bits of the TSC2003 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 II (*Power-Down Bit Functions*) of the TSC2003 data sheet for details on what these bits do.

6.4.4 Datalogging

The software can record the data it takes from the TSC2003 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 VBAT1, VBAT2, AUX1, AUX2 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 VBAT1, VBAT2, AUX1, AUX2 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, VBAT1, VBAT2, AUX1, AUX2, 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 TSC2003EVM and the USB-MODEVM Interface Board (included only in the TSC2003EVM-PDK).

Table 7. TSC2003EVM Bill of Materials

REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER	MFG. PART NUMBER
R1, R2, R3, R4	0Ω 1/8W 5% Chip Resistor	Panasonic	ERJ-6GEY0R00V
R5, R6, R7, R8	100Ω 1/8W 5% Chip Resistor	Panasonic	ERJ-6GEYJ101V
R9, R10, R11, R12, R13	2.7KΩ 1/10W 5% Chip Resistor	Panasonic	ERJ-3GEYJ272V
R14	51KΩ 1/10W 5% Chip Resistor	Panasonic	ERJ-3GEYJ272V
C11	1µF 16V Ceramic Chip Capacitor, +/ - 10%, X7R	TDK	C1608X7R1C105K
C9, C10	10µF 16V Ceramic Chip Capacitor, +/ - 20%, X5R	TDK	C3216X5R1C106M
C1, C2, C3, C4, C5, C6, C7, C8	Ceramic Chip Capacitor - Not installed		
U1	I^2C Touch Screen Controller	Texas Instruments	TSC2003IPW
U2	64K I^2C EEPROM	MicroChip	24LC64-I/SN
	TSC2003EVM PCB	Texas Instruments	6437755
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
JMP1, JMP2, JMP3, JMP4	2-position jumper , 0 .1" spacing	Samtec	TSW-102-07-L-S
JMP5	2 X 3 position header , 0 .1" spacing	Samtec	TSW-103-07-L-D
TP1	Multipurpose test point terminal	Keystone Electronics	5011
TP2	Miniature test point terminal	Keystone Electronics	5000
	Header shorting block	Samtec	SNT-100-BK-T

Table 8. USB-MODEVM Bill of Materials

REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER	MFG. 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^2C	Microchip	24LC64I/SN
	USB-MODEVM PCB	Texas Instruments	6463995

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

REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER	MFG. 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

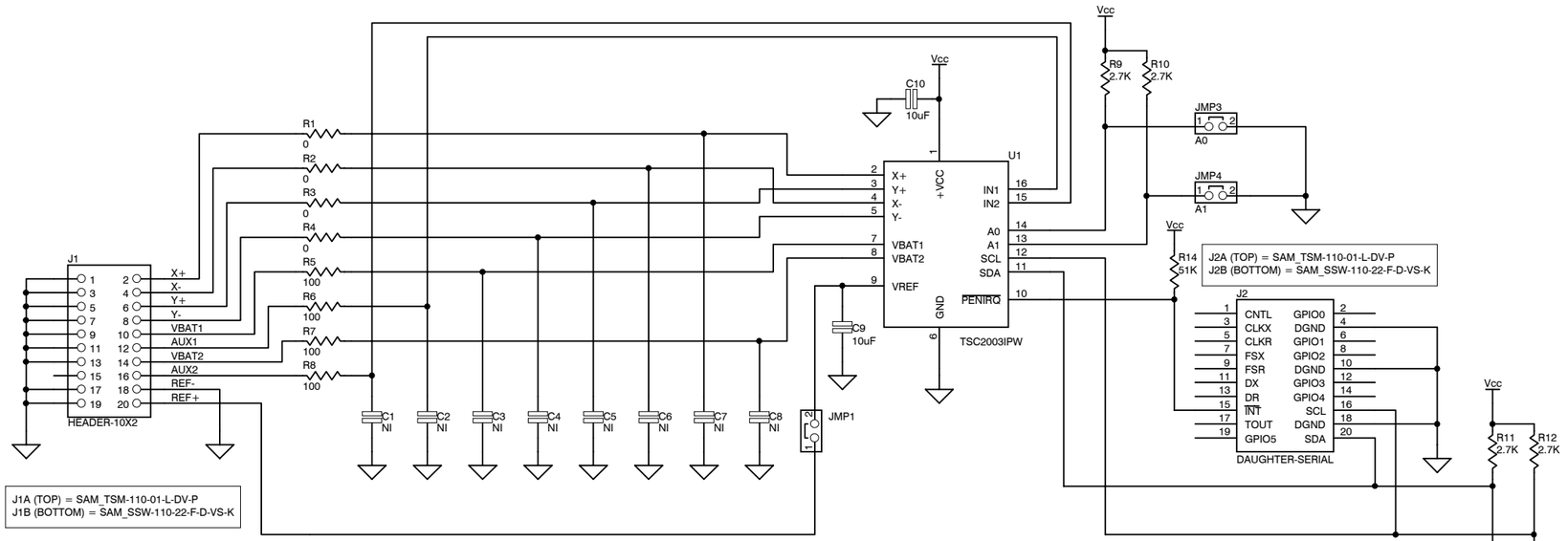
8 TSC2003EVM Schematic

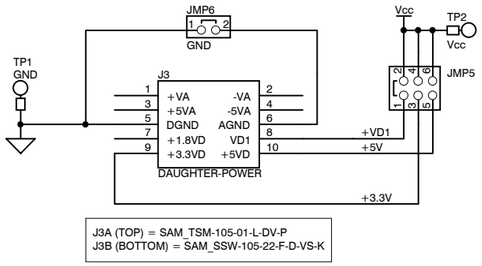
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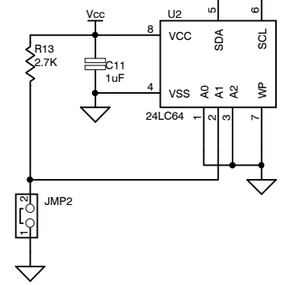
9 USB-MODEVM Schematic

The schematic diagram is provided as a reference.

REVISION HISTORY		
REV	ENGINEERING CHANGE NUMBER	APPROVED







TEXAS INSTRUMENTS

DATA ACQUISITION PRODUCTS
HIGH-PERFORMANCE ANALOG DIVISION
SEMICONDUCTOR GROUP

6730 SOUTH TUCSON BLVD., TUCSON, AZ 85706 USA

TITLE
TSC2003 Evaluation Module

ENGINEER **RICK DOWNS**			
DRAWN BY **ROBERT BENJAMIN**			
DOCUMENT CONTROL NO. **6437756**	SIZE **B**	DATE **31-Jan-2005**	REV **B**
SHEET **1** OF **1**	FILE **D:\tsc2003EVM\TSC2003EVM.ddb - SCH\TSC2003EVM.Sch**		

REVISION HISTORY		
REV	ENGINEERING CHANGE NUMBER	APPROVED

IOVDD
Q1 ZXMN6A07F
SDA
J6
EXTERNAL I2C
SCL
Q2 ZXMN6A07F
TP10
+3.3VD
TP9
R3 2.7K
R5 2.7K
+3.3VD
U1
VCC SDA SCL
VSS A0 A1 A2 WP
C9 1uF
24LC64I/SN
C18 33pF
X1
MA-505 6.000M-C0
6.00 MHZ
C19 33pF
J7 USB SLAVE CONN
GND D+ D- VCC
897-30-004-90-000000
R9 1.5K
R10 27.4
R11 27.4
C13 47pF
C14 47pF
C20 100pF
C21 .001uF
R12 3.09K
U8
TAS1020BPFB
SCL SDA VREN RESET MCLKO2 MCLKO1 CSCLK CDATO CDATI CSYNC CRESET CSCHNE
XTALO XTALI PLLFILI PLLFILO MCLKI PUR DP DM DVSS DVSS DVSS AVSS
P1.7 P1.6 P1.5 P1.4 P1.3 P1.2 P1.1 P1.0 DVDD DVDD DVDD AVDD
MRESET TEST EXTEN RSTO P3.0 P3.1 P3.2/XINT P3.3 P3.4 P3.5 NC NC
TP11 MRESET
+3.3VD
R13 649
USB ACTIVE
D2 SML-LX0603YW-TR YELLOW
JMP8 P1.3
JMP9 P1.2
JMP10 P1.1
JMP11 P1.0
JMP12 P3.5
JMP13 P3.4
JMP14 P3.3
C24 1uF
C10 1uF
C11 1uF
C12 1uF
+3.3VD
U3
SN74LVC125APW
1A 2A 3A 4A 1OE 2OE 3OE 4OE VCC 1Y 2Y 3Y 4Y GND
USB MCK
USB I2S
C22 1uF
IOVDD
C28 1uF
U10
SN74LVC1G125DBV
J10 EXT MCLK
R20 75
MCLK
I2SDIN
BCLK
LRCLK
I2SDOUT
+3.3VD
RA1 10K
SW2
A0 A1 A2 USB I2S USB MCK USB SPI USB RST EXT MCK
SW DIP-8
+3.3VD
R6 2.7K
U5
SN74LVC1G07DBV
C23 1uF
IOVDD
J14
EXTERNAL AUDIO DATA
PWR_DWN
+3.3VD
R7 2.7K
U7
SN74LVC1G07DBV
C26 1uF
IOVDD
MISO
MOSI
SS
SCLK
RESET
C27 1uF
IOVDD
U4
SN74LVC125APW
1A 2A 3A 4A 1OE 2OE 3OE 4OE VCC 1Y 2Y 3Y 4Y GND
J15
EXTERNAL SPI
USB RST
USB SPI
INT
+3.3VD
R8 2.7K
C25 1uF
IOVDD
U6
SN74LVC1G07DBV
J8
ED555/2DS
EXT PWR IN
6VDC-10VDC IN
JMP6
PWR SELECT
+5VD
R14 390
D3 SML-LX0603GW-TR GREEN
U2
REG1117-5
VIN GND VOUT
D1 DL4001
C15 0.1uF
C16 0.33uF
C6 10uF
J9
CUI-STACK PJ102-B
2.5 MM
SW1
1.8VD ENABLE
3.3VD ENABLE
REGULATOR ENABLE
R15 10K
R16 10K
U9
TPS767D318PWP
1IN 1IN 1EN 1GND 2GND 2EN 2IN 2IN 1RESET 1OUT 1OUT 2RESET 2OUT 2OUT
R17 100K
R18 100K
C7 10uF
C8 10uF
C17 0.33uF
+1.8VD
R4 10
D5 SML-LX0603IW-TR RED
+3.3VD
R19 220
D4 SML-LX0603GW-TR GREEN
+5VD
+3.3VD
+1.8VD
JMP7
IOVDD SELECT
IOVDD
TP6

ENGINEER	**RICK DOWNS**
DRAWN BY	**ROBERT BENJAMIN**
DOCUMENT CONTROL NO.	**6463996**
SHEET	**1** OF **2**

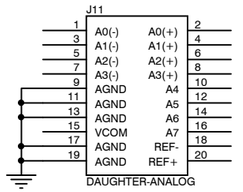
TEXAS INSTRUMENTS
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SEMICONDUCTOR GROUP
6730 SOUTH TUCSON BLVD., TUCSON, AZ 85706 USA

TITLE
USB-MODEVM INTERFACE

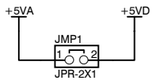
SIZE **B** | DATE **28-Oct-2004** | REV **B**

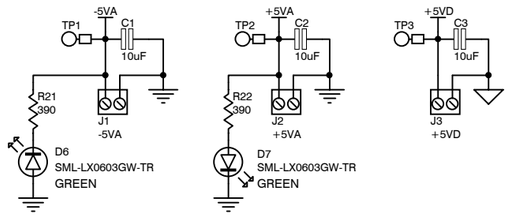
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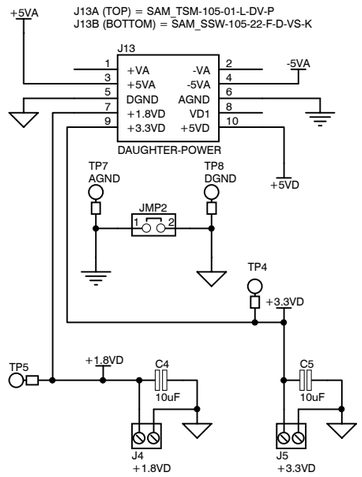
REVISION HISTORY		
REV	ENGINEERING CHANGE NUMBER	APPROVED



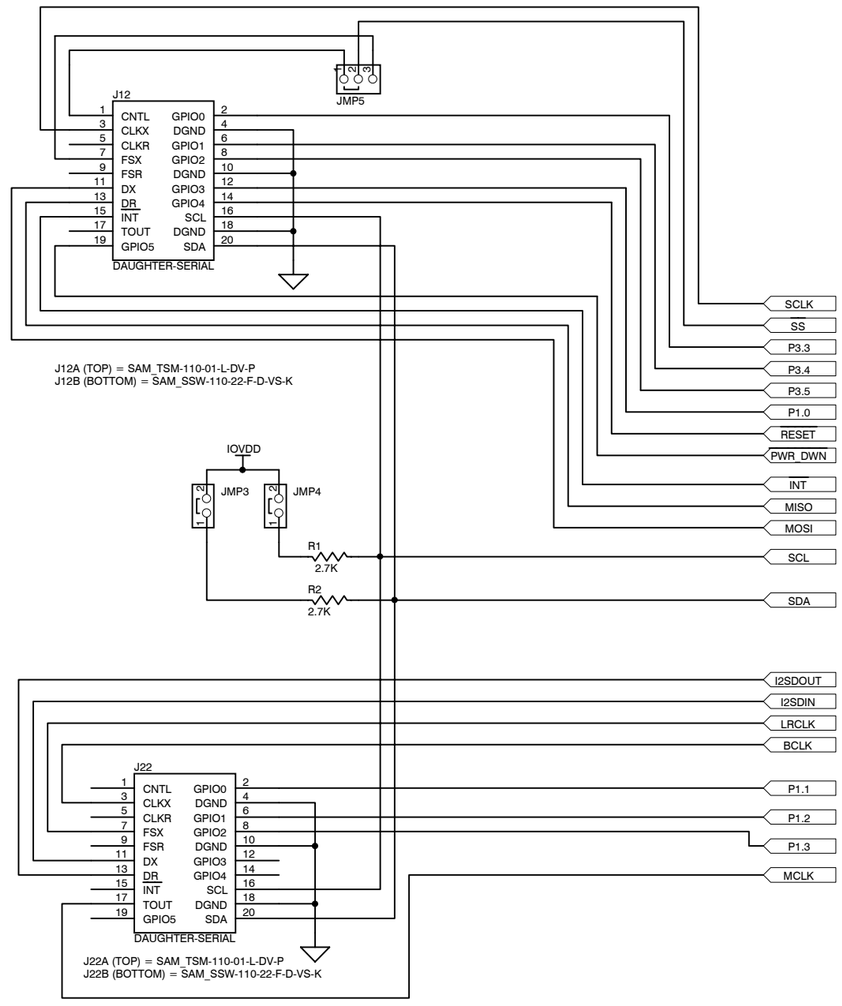
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J11B (BOTTOM) = SAM_SSW-110-22-F-D-VS-K





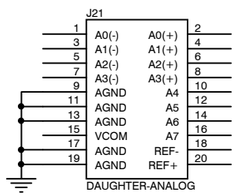


J13A (TOP) = SAM_TSM-105-01-L-DV-P
J13B (BOTTOM) = SAM_SSW-105-22-F-D-VS-K

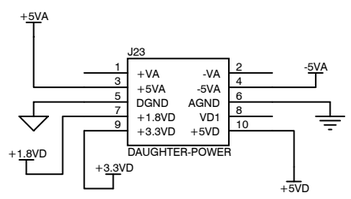


J12A (TOP) = SAM_TSM-110-01-L-DV-P
J12B (BOTTOM) = SAM_SSW-110-22-F-D-VS-K

J22A (TOP) = SAM_TSM-110-01-L-DV-P
J22B (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

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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**	SIZE **B**	DATE **28-Oct-2004**	REV **B**
SHEET **2** OF **2**	FILE **D:\USB-MODEVM\USB Motherboard - ModEvm.ddb - Documents\Daughtercard Interface**		

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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.

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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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