Texas Instruments

TUSB3210 Generic Evaluation Board

User's Guide

2005

MSP USB

SLLU031A

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

EVM IMPORTANT NOTICE

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation kit being sold by TI is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not considered by TI to be fit for commercial use. As such, the goods being provided may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety measures typically found in the end product incorporating the goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may not meet the technical requirements of the directive.

Should this evaluation kit not meet the specifications indicated in the EVM User's Guide, the kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Please be aware that the products received may not be regulatory compliant or agency certified (FCC, UL, CE, etc.). Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

TI currently deals with a variety of customers for products, and therefore our 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 described herein**.

Please read the EVM User's Guide and, specifically, the EVM Warnings and Restrictions notice in the EVM User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact the TI application engineer.

Persons handling the product must have electronics training and observe good laboratory practice standards.

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 such TI products or services might be or are used.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 4 V to 6 V and the output voltage range of 3 V to 3.6 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 50°C. The EVM is designed to operate properly with certain components above 50°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.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

Preface

Read This First

About This Manual

This user's guide describes the setup and operation of the TUSB3210 generic evaluation board. Familiarity with universal serial bus (USB) protocol and common laboratory testing equipment is required and assumed throughout this user's guide.

How to Use This Manual

This document contains the following chapters:

- ❏ Chapter 1—Hardware and Software Required
- ❏ Chapter 2—EVM Operation

Related Documentation From Texas Instruments

- ❏ TUSB3210 Literature No. SLLS466
- ❏ TPS76333 Literature No. SLVS181
- ❏ TPS2042 Literature No. SLVS173
- ❏ MAX232 Literature No. SLLS047
- ❏ MAX3232 Literature No. SLLS410
- ❏ Bootcode Literature No. SLLU025

These files are available from Texas Instruments; contact technical support for assistance.

Trademarks

MacOS is a trademark of Apple Computer, Inc.

Windows and Windows ME are trademarks of Microsoft Corporation.

Other trademarks are the property of their respective owners

FCC Warning

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments 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.

Contents

Figures

Tables

Chapter 1

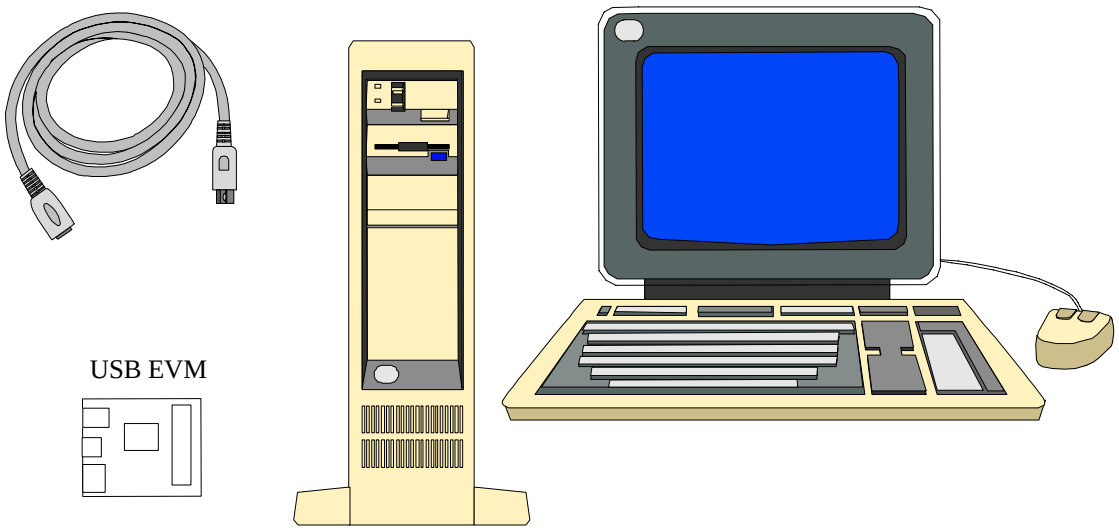
Hardware and Software Required

The TUSB3210 generic EVM is designed for use with a personal computer running a USB-enabled operating system. The PC should be USB 1.1 specification compliant. This implies that the BIOS, chipsets, and operating system are all USB 1.1 specification compliant. If the BIOS is not specification compliant, the system may not boot up when USB devices are connected at power up, and the EVM may not function. Note that an ac/dc power supply adapter is optional equipment (but included), because the EVM can function in either bus-powered mode or self-powered mode.

Topic **Page**

1.1 Equipment

Figure 1–1. TUSB3210 Evaluation Equipment



1.2 Hardware Overview

The TUSB3210 EVM hardware platform is 11 cm wide by 13 cm long. Throughout this document, text inside of parenthesis (ex.) denotes reference designators found on the TUSB3210 EVM. See Figure 1–2 for a photograph of the EVM. All jumpers are installed with the factory settings. See the jumper table for a description of settings, and make any required adjustments before using the EVM.

The TUSB3210 EVM design allows great evaluation flexibility and provides a platform that is practical and easy to use. The EVM runs on a 12-MHz crystal and uses an I^2C EEPROM. The EVM is set up for bus-powered operation using a 5-V to 3.3-V voltage regulator. The UART port is disabled. The firmware installed in the EEPROM allows USB HID-class-enabled operating systems such as Windows™ 98, Windows 2000, Windows ME™, and MacOS™ to directly access it like a keyboard, although it does not have one.

Reference firmware is installed and the source code is available to developers. The RS-232 port is available for monitoring 8052 MCU activity for debugging purposes. The port uses a one-to-one serial port cable instead of a null modem. Several test points have been added to the EVM for probing. Carefully review all setting changes prior to powering the EVM, as improper use could result in damage to some of the EVM components.

This EVM is generic in the sense that it provides a 50-pin connector that allows access to the GPIO pins of the TUSB3210. It is meant to be used with another application-specific daughterboard that connects to the 50-pin connector. An example of such a daughterboard is shown in Figure 1–3. Users are responsible for developing their own application firmware for the target hardware device. LED (D4) provides power and suspend status to the

TUSB3210 device. A USB cable should be plugged into a USB port on a PC or into a USB hub and connected to the TUSB3210 EVM type-B connector (U3).

Figure 1–2. TUSB3210 Evaluation Board

Figure 1–3. TUSB3210 EVM Connected to a Compact Flash Daughterboard

Figure 1–4. TUSB3210 Printed-Circuit Board (REV 1.1)—Top Side

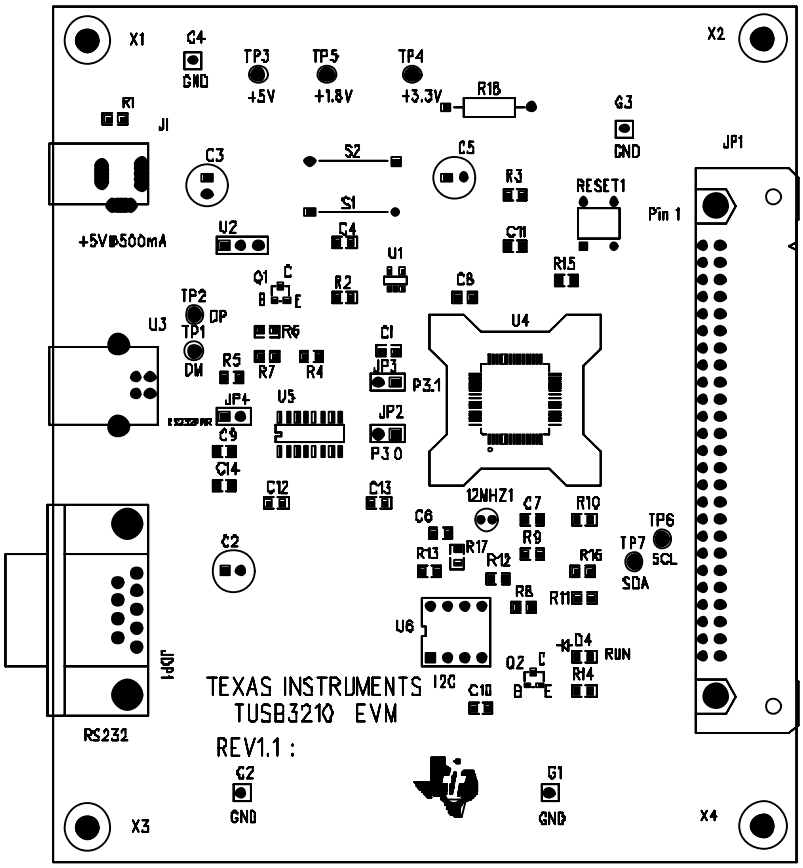
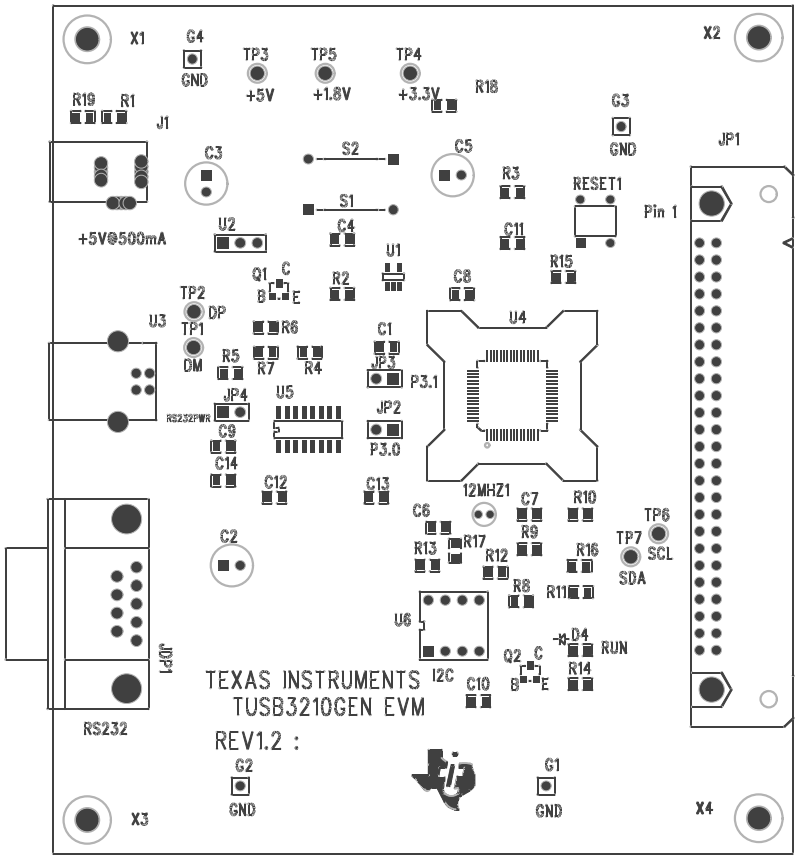


Figure 1–5. TUSB3210 Printed-Circuit Board (REV 1.2)—Top Side



1.3 Bill of Materials

Item	Quantity	Reference	Part
1	3 (REV 1.1 board)	C1, C4, C10	Capacitor, 0.1 μF
1	7 (REV 1.2 board)	C1, C4, C9, C10, C12, C13, C14	Capacitor, 0.1 μF
2	2	C2, C5	Capacitor, 4.7 μF
3	1	C3	Capacitor, 10 μF
4	3	C6, C7, C8	Capacitor, 22 pF
5	5 (REV 1.1 board)	C9, C11, C12, C13, C14	Capacitor, 1 μF
5	1 (REV 1.2 board)	C11	Capacitor, 1 μF
6	1	D4	LED, RUN (red)
7	4	G1, G2, G3, G4	CON1
8	1	JDP1	DB 9–F (1–2–1 cable only)
9	1	JP1	Connector plug 25×2
10	1	JP2	Jumper (P3.0)
11	1	JP3	Jumper (P3.1)
12	1	JP4	Jumper
13	1	J1	AC adaptor 5 Vdc
14	1	Q1	NPN transistor, 2N2222A
15	1	Q2	PNP transistor, MMBT4403
16	1	RESET1	Pushbutton switch
17	6	R2, R3, R8, R9, R10, R18	Resistor, 100 kΩ
18	1	R4	Resistor, 1.5 kΩ
19	2	R5, R11	Resistor, 15 kΩ
20	2	R7, R6	Resistor, 33 Ω
21	2	R13, R12	Resistor, 1.2 kΩ
22	2	R14, R16	Resistor, 510 Ω
23	1	R15	Resistor, 10 Ω
24	1	R17	Resistor, 1 MΩ
25	2	S2, S1	Short
26	7	TP1, TP2, TP3, TP4, TP5, TP6, TP7	Test point
27	1	U1	Jumper, TPS76333DBV
28	1	U2	Jumper. JP(3)
29	1	U3	Type-B USB shield
30	1	U4	USB controller, TUSB3210
31	1	U5	MAX232 (REV 1.1 board) MAX3232 (REV 1.2 board)
32	1	U6	Eight-pin socket for 24LCxx
33	1	12 MHz	SE3409-ND

1.4 Schematic Diagram

The complete schematic diagram of the TUSB3210 generic EVM is presented at the end of this document.

Chapter 2

EVM Operation

This chapter describes the operation of the TUSB3210 EVM.

Topic **Page**

2.1 TUSB3210 Setup

The TUSB3210 EVM supports many USB applications. The jumpers allow the flexibility to configure the EVM in various modes for evaluation purposes. Note that some modes require additional components not included with the EVM kit. The EVM comes in a default configuration that requires no additional components on the EVM. A full description of the TUSB3210 device is specified in the data manual (SLLS466). The PC must be running a USB-capable operating system.

If necessary, configure the EVM based on the desired settings specified later in this section. Use a standard USB cable to connect the TUSB3210 EVM to a downstream port on the PC or to a USB HUB tier.

2.2 Interfaces and USB Port

The EVM uses a standard type-B connector for the upstream port. An I^2C serial interface is provided to access an I^2C EEPROM. A UART port is embedded in the microcontroller and is connected to the RS-232 port on the EVM. The RS-232 port connection can be broken using the jumpers. See jumper settings for more details. All GPIO signals are available on the 50-pin connector JP1 for use by the specific application.

2.3 Power Supplies

The TUSB3210 EVM requires a single positive 5-V power supply for operation. Two options are available for supplying power to the EVM:

- Self-powered mode: a switching 5-V dc power supply plugged into (J1)
- Bus-powered mode: 5-V power is supplied by the USB cable.

Note that the supply needs to have a rating of at least 0.5 A. The EVM may fail to operate properly with less power. An onboard low-dropout regulator is used to generate a 3.3-V supply from the 5-V external supply. The red LED (D4) is on when the platform is powered. See also the *Jumpers and Switches* section.

2.4 Light Emitting Diodes (LEDs)

Table 2–1. LED Description

LED	LED Description
D4	Red LED on indicates that the EVM is powered on and not suspended. Red LED off indicates that the EVM is powered off or suspended.

2.5 Jumpers and Switches

Table 2–2 is provided to help set up and configure the EVM platform jumpers to the desired mode of operation. The EVM can download firmware code from the PC through a loading program (which may or may not be supplied with your EVM) or from an I^2C EEPROM. A 5-V power source may be supplied from an external source or from the USB cable. If supplied from an external source, U2 must be set to position 2–3. If supplied from the USB cable, set U2 to position 1–2. The 5-V source is used to generate 3.3 V using an LDO regulator. JP2 and JP3 are used to connect P3.0 and P3.1 to R1OUT and T1IN of the RS232 connector, respectively. JP4 must be set to off when not using the MCU's UART.

Table 2–2. Jumpers and Switches

Jumper/Switch	Jumper/Switch Description
U2	Position 1–2: 5-V bus power supply; position 2–3: 5-V dc or 5-V switching supply
JP2	Position 1–2 on: connect P3.0 to R1OUT; position 1–2 off: disconnect P3.0 from R1OUT
JP3	Position 1–2 on: connect P3.1 to T1IN; position 1–2 off: disconnect P3.1 from T1IN
JP4	Position 1–2 on: supplies power to RS–232 transceiver; position 1–2 off: RS–232 transceiver is not powered. See Note.

NOTE: JP4 supplies 5 V to the RS–232 transceiver for the REV 1.1 board. JP4 supplies 3.3 V to the RS–232 transceiver for the REV 1.2 board.

2.6 EEPROM

The I^2C EEPROM provides application-specific firmware. The TUSB3210 automatically reads the EEPROM at power up via the I^2C bus. A header must be added to the application firmware before loading into the EEPROM. See the *TUSB2136/3210 Bootcode Document for USB to General_Purpose Device ccontroller* user's guide (SLLU025) for a description of the header definition. The header may be generated automatically using the *I^2C Header Generation Utility* software provided with the device.

The EVM ships with a preprogrammed EEPROM that has either keyboard controller firmware or compact flash reader firmware. It enumerates properly when connected to a USB host.

2.7 GPIO Connector

The 50-pin GPIO connector provides access to the TUSB3210 GPIOs as well as some other control signals. Figure 2–1 shows the signals available on the connector.

Figure 2–1. GPIO Connector