



# **TUSB3210 Generic Evaluation Board**

## *User's Guide*

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## **EVM WARNINGS AND RESTRICTIONS**

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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.

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.

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## Preface

# Read This First

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### ***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***

- |                                   |                         |
|-----------------------------------|-------------------------|
| <input type="checkbox"/> TUSB3210 | Literature No. SLLS466  |
| <input type="checkbox"/> TPS76333 | Literature No. SLVS181D |
| <input type="checkbox"/> TPS2042  | Literature No. SLVS173A |
| <input type="checkbox"/> MAX232   | Literature No. SLLS047G |

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# Hardware and Software Required

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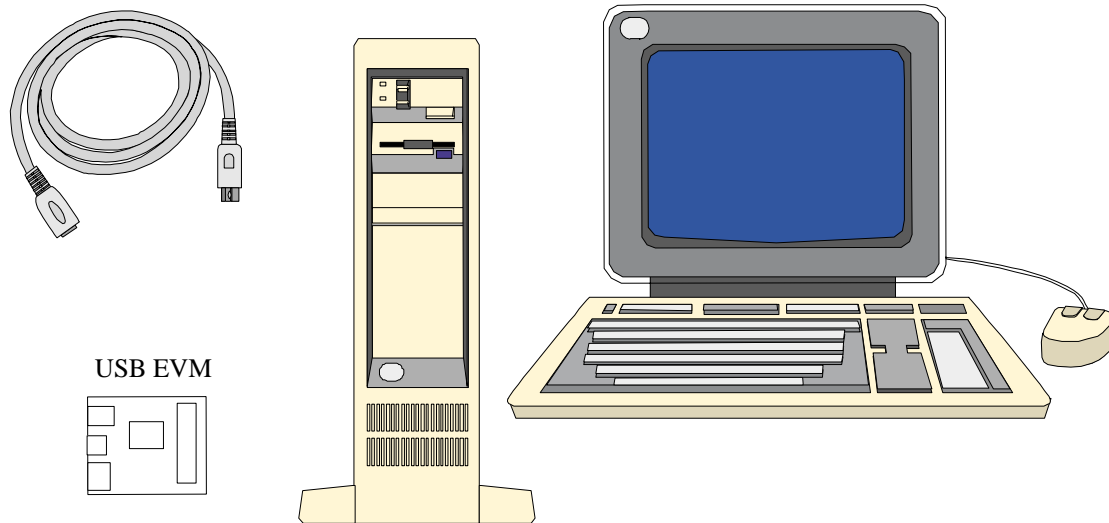
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The TUSB3210 generic EVM is designed for use with a personal computer running a USB-enabled operating system. The PC should be USB 1.1 specification compliant. This implies that the BIOS, chipsets, and operating system are all USB 1.1 specification 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), since the EVM can function in either bus-powered mode or self-powered mode.

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## 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. Refer to 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 is designed to run on a 12-MHz crystal and uses an I<sup>2</sup>C 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 Windows98™, Windows2000™, WindowsME™, 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 in conjunction with another application-specific daughterboard that connects to the 50-pin connector. An example of such daughterboard is shown in Figure 1–3. The user is responsible for developing his/her 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

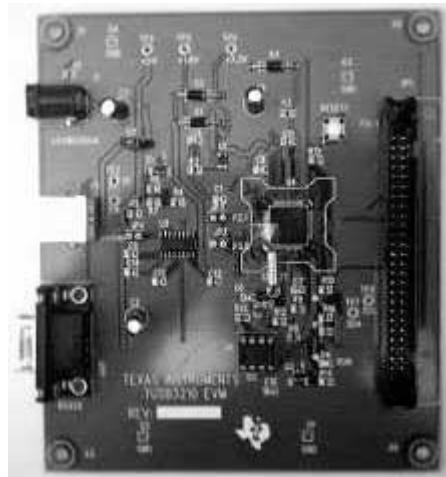
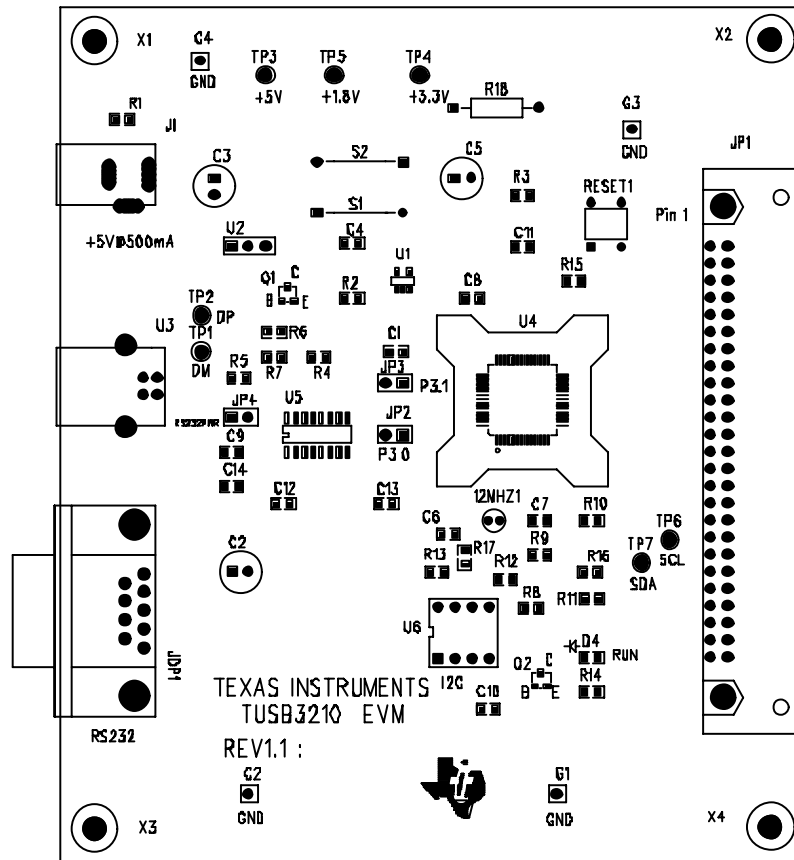


Figure 1–3. TUSB3210 EVM Connected to a Compact Flash Daughterboard



Figure 1–4. TUSB3210 Printed-Circuit Board—Top Side



### 1.3 Bill of Materials

Item	Quantity	Reference	Part
1	3	C1, C4, C10	Capacitor, 0.1 $\mu$ F
2	2	C2, C5	Capacitor, 4.7 $\mu$ F
3	1	C3	Capacitor, 10 $\mu$ F
4	3	C6, C7, C8	Capacitor, 22 pF
5	5	C9, C11, C12, C13, C14	Capacitor, 1 $\mu$ F
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 25x2
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 k $\Omega$
18	1	R4	Resistor, 1.5 k $\Omega$
19	2	R5, R11	Resistor, 15 k $\Omega$
20	2	R7, R6	Resistor, 33 $\Omega$
21	2	R13, R12	Resistor, 1.2 k $\Omega$
22	2	R14, R16	Resistor, 510 $\Omega$
23	1	R15	Resistor, 10 $\Omega$
24	1	R17	Resistor, 1 M $\Omega$
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
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.



# EVM Operation

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This chapter describes the operation of the TUSB3210 EVM.

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## 2.1 TUSB3210 Setup

The TUSB3210 EVM is designed to support 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. 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<sup>2</sup>C serial interface is provided to access an I<sup>2</sup>C 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. There are two options 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<sup>2</sup>C 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: enable RS–232 port; position 1–2 off: disable RS–232 port

## 2.6 EEPROM

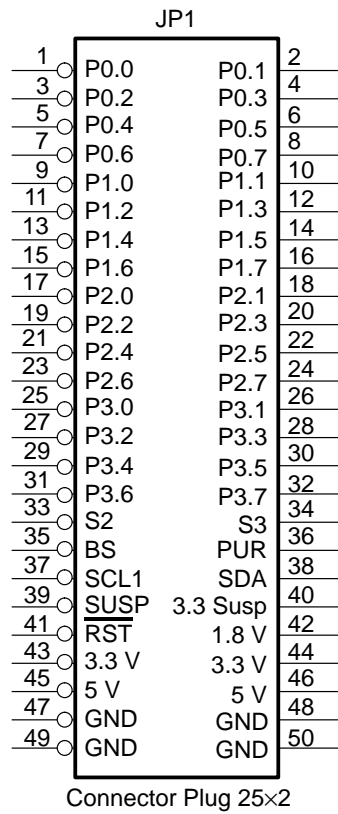
The I<sup>2</sup>C EEPROM is used to provide application-specific firmware. The TUSB3210 automatically reads the EEPROM at power up via the I<sup>2</sup>C bus. A header must be added to the application firmware before loading into the EEPROM. Please refer to the *TUSB3210 Bootcode* document for a description of the header definition. The header may be generated automatically using the *I<sup>2</sup>C Header Generation Utility* software provided with the device.

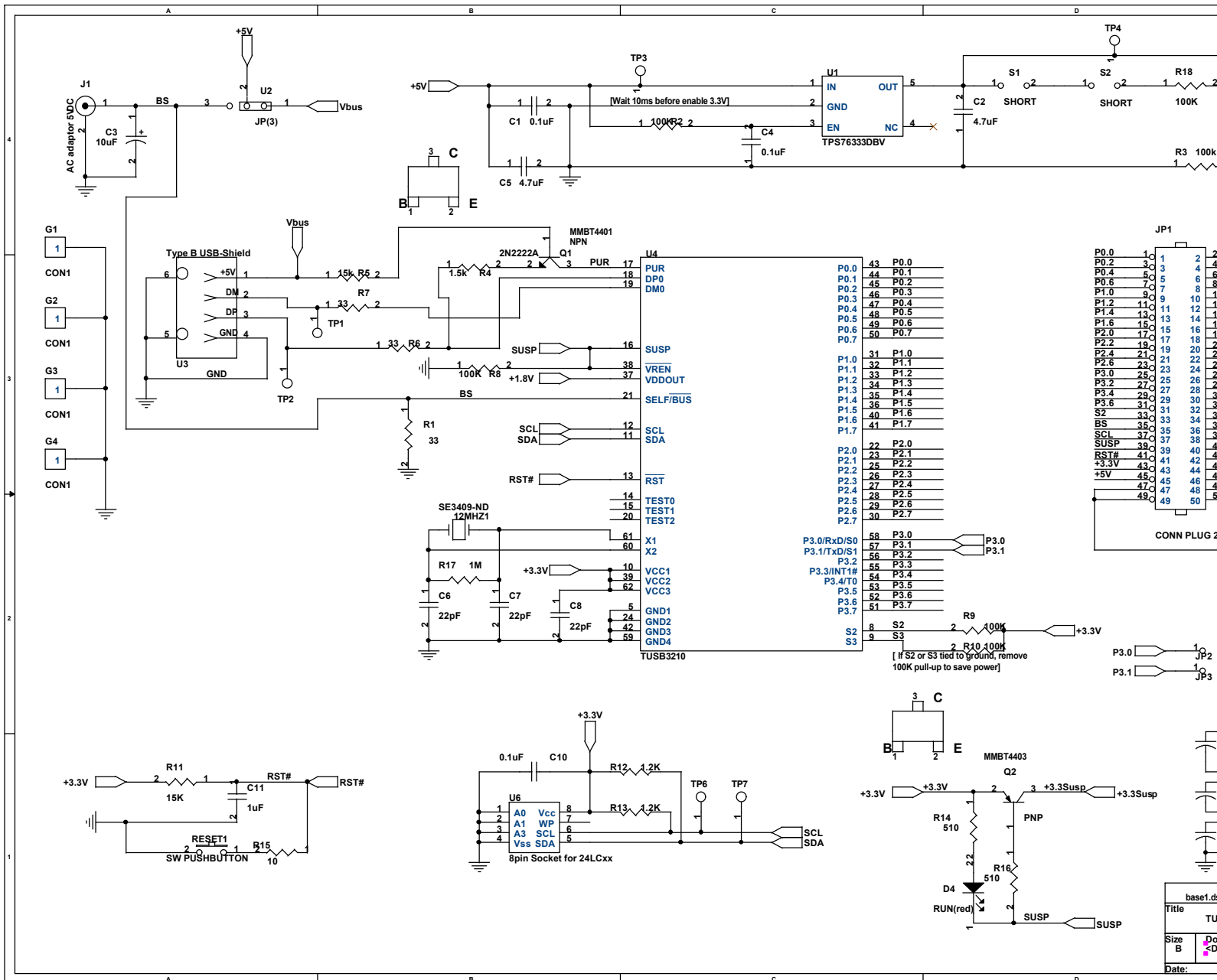
The EVM ships with a preprogrammed EEPROM that has either keyboard controller firmware or compact flash reader firmware. It enumerates properly when connected to a USB host.

## 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





P0.0	43	P0.0
P0.1	44	P0.1
P0.2	45	P0.2
P0.3	46	P0.3
P0.4	47	P0.4
P0.5	48	P0.5
P0.6	49	P0.6
P0.7	50	P0.7
P1.0	31	P1.0
P1.1	32	P1.1
P1.2	33	P1.2
P1.3	34	P1.3
P1.4	35	P1.4
P1.5	36	P1.5
P1.6	40	P1.6
P1.7	41	P1.7
P2.0	22	P2.0
P2.1	23	P2.1
P2.2	25	P2.2
P2.3	26	P2.3
P2.4	27	P2.4
P2.5	28	P2.5
P2.6	29	P2.6
P2.7	30	P2.7
P3.0/RxD/S0	58	P3.0
P3.1/TxD/S1	57	P3.1
P3.2	56	P3.2
P3.3/INT#	55	P3.3
P3.4/T0	54	P3.4
P3.5	53	P3.5
P3.6	52	P3.6
P3.7	51	P3.7

P0.0	1	2
P0.2	3	4
P0.4	5	6
P0.6	7	8
PT.0	9	10
P1.2	11	12
P1.4	13	14
P1.6	15	16
P2.0	17	18
P2.2	19	20
P2.4	21	22
P2.6	23	24
P3.0	25	26
P3.2	27	28
P3.4	29	30
P3.6	31	32
BS	33	34
SCL	35	36
SUSP	37	38
RST#	39	40
+3.3V	41	42
+5V	43	44
	45	46
	47	48
	49	50

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