TEXAS INSTRUMENTS

TUSB3410 General-Purpose Input/Output Evaluation Board

User's Guide

September 2002

Universal Serial Bus Products

SLLU041

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 4.75 V and the output voltage range of 4.75 V and 5.25 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 60°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

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Preface

Read This First

About This Manual

This user's guide describes the setup and operation of the TUSB3410 general-purpose input/output evaluation board. Familiarity with the universal serial bus (USB) protocol and common lab testing equipment is required, and is assumed throughout this user's guide.

How to Use This Manual

This document contains the following chapters:

- Chapter 1—Required Hardware and Software
- Chapter 2—EVM Operation
- Chapter 3—Bill of Materials and EVM Layouts
- Appendix A—TUSB3410 GPIO EVM Schematic Diagram

Related Documentation From Texas Instruments

TUSB3410 USB to Serial Port Controller data manual Literature No. SLLS519

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.

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Chapter 1

Required Hardware and Software

The TUSB3410 general-purpose input-output EVM was designed for use with a personal computer running a USB-enabled operating system. The PC should be USB 1.1 or USB 2.0 spec compliant. This implies the BIOS, chip-sets, and operating system are all spec compliant. If the BIOS is not spec compliant, the system may not boot when USB devices are connected at power up and the EVM may not function. Note that the EVM can only function in the bus-powered mode.

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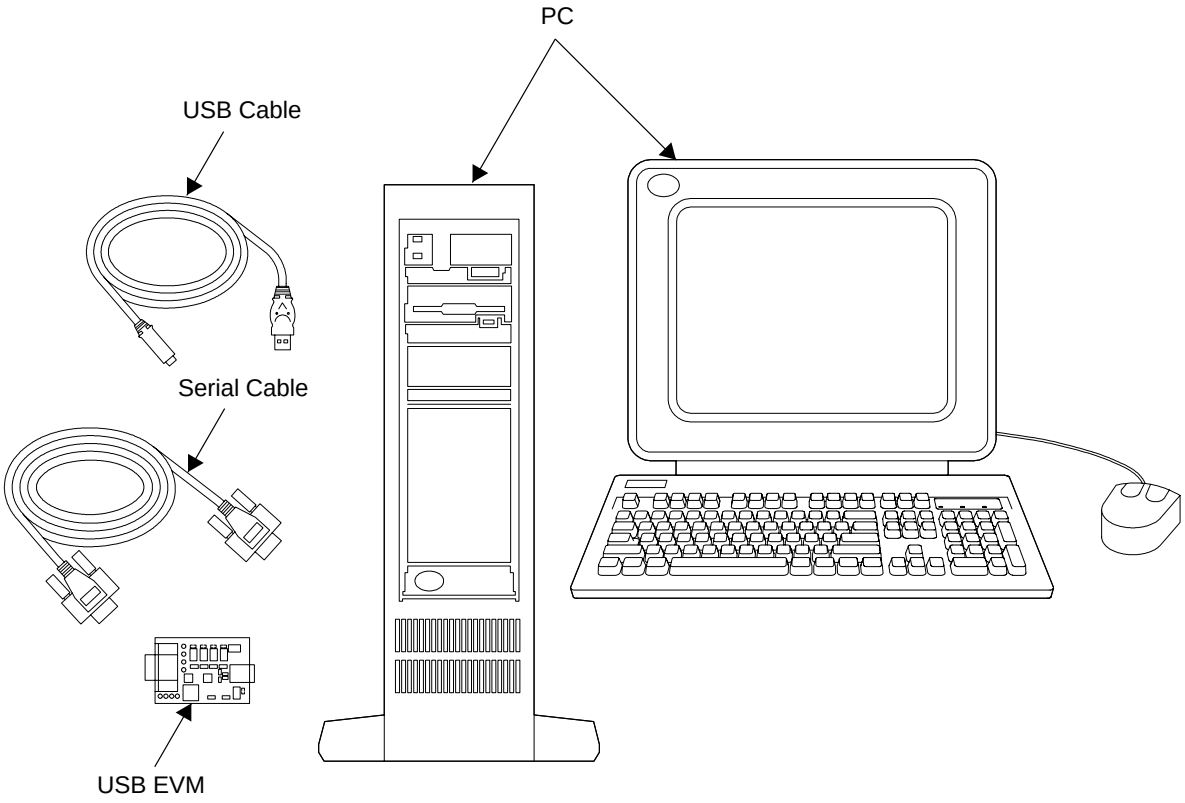
1.1 Hardware Items 1-2

1.2 Hardware Overview 1-3

1.1 Hardware Items

The TUSB3410 EVM is shown in Figure 1, together with typical representations of the hardware items required for its use.

Figure 1–1. TUSB3410 Evaluation Hardware



1.2 Hardware Overview

The TUSB3410 GPIO EVM hardware platform is 4,3 cm × 6,8 cm in width × length. Throughout this document, text inside of parentheses (ex.) is reference designators found on the TUSB3210 EVM. See Figure 1–2 for a reference picture of the EVM. First, all jumpers are installed with the factory settings. See Table 2–3 for a description of jumper settings and make any required changes before using the EVM. The TUSB3410 GPIO EVM is designed to allow great flexibility in evaluation while being very easy and practical to use. The EVM is designed to run using a 12-MHz crystal and an I^2C EEPROM. The EVM is set up for bus-powered operation using a 5-V to 3.3-V voltage regulator. The firmware installed at the factory in the EEPROM is special USB keyboard firmware, which makes it very easy for evaluation on any USB-enabled OS without the need for a device driver. The firmware installed is reference firmware and the source code is available for developers. The RS-232 port is available for monitoring 8052 MCU activity for debugging purposes. The RS-232 port requires a 1-to-1 cable, not a null-modem cable. Several test points have been added to the EVM for probing. An LED (D2) displays the suspend status of the TUSB3410 device. A USB cable should be plugged into a USB port on a PC or USB hub and connected to the TUSB3410 EVM type-B USB connector (U3).

Figure 1–2. TUSB3410 GPIO Evaluation Board

Chapter 2

EVM Operation

This chapter provides information required for proper operation of the TUSB3410 GPIO EVM. This includes power and PC connection requirements, as well as descriptions of important operating features of the board, such as switches, jumpers, and indicators.

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2.1 TUSB3410 EVM Setup

The TUSB3410 general-purpose EVM is designed to support many USB applications. The EVM comes in a default configuration that requires no additional components on the EVM. A full description of the TUSB3410 device is specified in the data manual. The PC must be running a USB-capable operating system. Configure the EVM if required, based on desired settings specified later in this section. Use a standard USB cable to connect the TUSB3410 EVM to a downstream port of the PC or a USB hub tier.

2.2 Interfaces and USB Ports

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 not be disabled by using the jumpers. See jumper settings for more details. There are four buttons and four LEDs on the EVM that can be used as general-purpose inputs and outputs to evaluate how the system works.

2.3 Power Supply

The TUSB3410 EVM uses USB bus power as its power supply.

2.4 Buttons

Table 2–1. Button Description

Button	Button Description
SW1	System reset
SW2	Wakes up system if system is in suspend mode
SW3	General-purpose input, pulls P3.0 low if pressed
SW4	General-purpose input, pulls P3.1 low if pressed
SW5	General-purpose input, pulls P3.4 low if pressed
SW6	General-purpose input, pulls P3.3 low if pressed

2.5 Light Emitting Diodes (LEDs)

Table 2–2. LED Description

LED	LED Description
D2	LED on indicates that the EVM is suspended LED off indicates that EVM is not suspended
D3	General-purpose output, indicates status of P3.0 (RXD)
D4	General-purpose output, indicates status of P3.1 (TXD)
D5	General-purpose output, indicates status of P3.4
D6	General-purpose output, indicates status of P3.3

2.6 Jumpers

Table 2–3 is provided to help set up and configure the EVM platform jumpers for the desired mode of operation. The EVM can download firmware code from the PC through a loading program (may or may not be supplied with your EVM) or from an I^2C EEPROM. JP2 and JP3 are used to connect P3.0 and P3.1 to D3 and D4 respectively. JP4 is for separating the SCL pin of the I^2C EEPROM from SCL of the TUSB3410.

Table 2–3. Jumper Description

Jumper	Jumper Description
JP1	Installed: connect suspend LED to SUSP pin of TUSB3410
JP2	Installed: connect LED D4 and SW4 to P3.1 (GPIO_TXD)
JP3	Installed: connect LED D3 and SW3 to P3.0 (GPIO_RXD)
JP4	Installed: connect SCL of I^2C EEPROM to SCL of TUSB3410 for normal operation Uninstalled: downloads firmware from USB instead of I^2C EEPROM

2.7 EEPROM

The I^2C EEPROM is used to provide application-specific firmware. The TUSB3410 automatically reads the EEPROM at power up via the I^2C bus. A header must be added to the application firmware before loading it into the EEPROM. See the TUSB3410 data manual for a description of the header definition. The header can be generated automatically using the I^2C header-generation utility software provided with the device.

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

Chapter 3

Bill of Materials and EVM Layouts

This chapter describes the bill of materials and EVM layouts for the TUSB3410 EVM.

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3.1 Bill of Materials

Item	Qty.	Reference	Part	Part Number	PCB Footprint
1	1	CN2	Connector-DB9	747250-4	DB9-HF
2	2	C21, C1	1 μF	C2012X7R1C105M	SMT_0805
3	1	C2	4.7 μF	C3216X7R1C475M	SMT_1206
4	8	C3, C6, C8, C10, C49, C50,	0.1 μF	C1608X7R1H104K	SMT_0603
		C51, C52			
5	2	C4,C5	0.01 μF	C1608X7R1H103K	SMT_0603
6	7	C7, C9, C53, C54, C55, C56, C57	0.001 μF	C1608X7R1H102K	SMT_0603
7	2	C11, C12	22 pF	C1608C0G1H220J	SMT_0603
8	2	C20, C19	33 pF	C1608C0G1H330J	SMT_0603
9	1	D1	SOT-23-diode	BAS21ZXCT-ND	SOT23-DIODE
10	5	D2, D3, D4, D5, D6	LED	160-1421-1-ND	SMT_0805
11	1	F2	TDK MPZ2012S331A	MPZ2012S331A	MPZ2012
12	4	JP1, JP2, JP3, JP4	Jumper		HDR1X2
13	1	R1	90.9 kΩ	P100KCCT-ND	SMT_0603
14	1	R2	100 kΩ	P100KCCT-ND	SMT_0603
15	1	R3	1.5 kΩ	P1.50KCCT-ND	SMT_0603
16	2	R4, R5	33 Ω	P33.2CCT-ND	SMT_0603
17	8	R9, R10, R14, R15, R16, R17,	1 kΩ	P1.00KCCT-ND	SMT_0603
		R18, R19			
18	1	R11	32 kΩ	P32.4KCCT-ND	SMT_0603
19	1	R12	10 kΩ	P10.0KCCT-ND	SMT_0603
20	1	R13	15 kΩ	P15.0KCCT-ND	SMT_0603
21	1	R20	5 kΩ	P1.50KCCT-ND	SMT_0603
22	1	R21	5 kΩ	P10.0KCCT-ND	SMT_0603
23	6	SW1, SW2, SW3, SW4, SW5, SW6	Switch	7914G-1-000E	MOM-SW
24	2	TP5, TP6	T point R	HDR1X1	TP52
25	2	TP7,TP8	Test point		TP52
26	5	TP9, TP10, TP11, TP12, TP13	Test point, small		TP52
27	1	U1	TUSB3410	TUSB3410	LQFP-32
28	1	U2	TPS76933	TPS76933DBVT	SOT-5P
29	1	U3	Type B USB-shield	AE1085-ND	4P-B-RECEP
30	1	U5	8-pin socket for 24LCxx	A400-ND	DIP8_SKT
31	1	U6	MAX3221E	MAX322E T.I.	MAX3221E
32	1	Y1	12-MHz crystal HC49SMD	P-16695	CRYSTEK

3.2 EVM Layouts

Figure 3–1. Top Layer

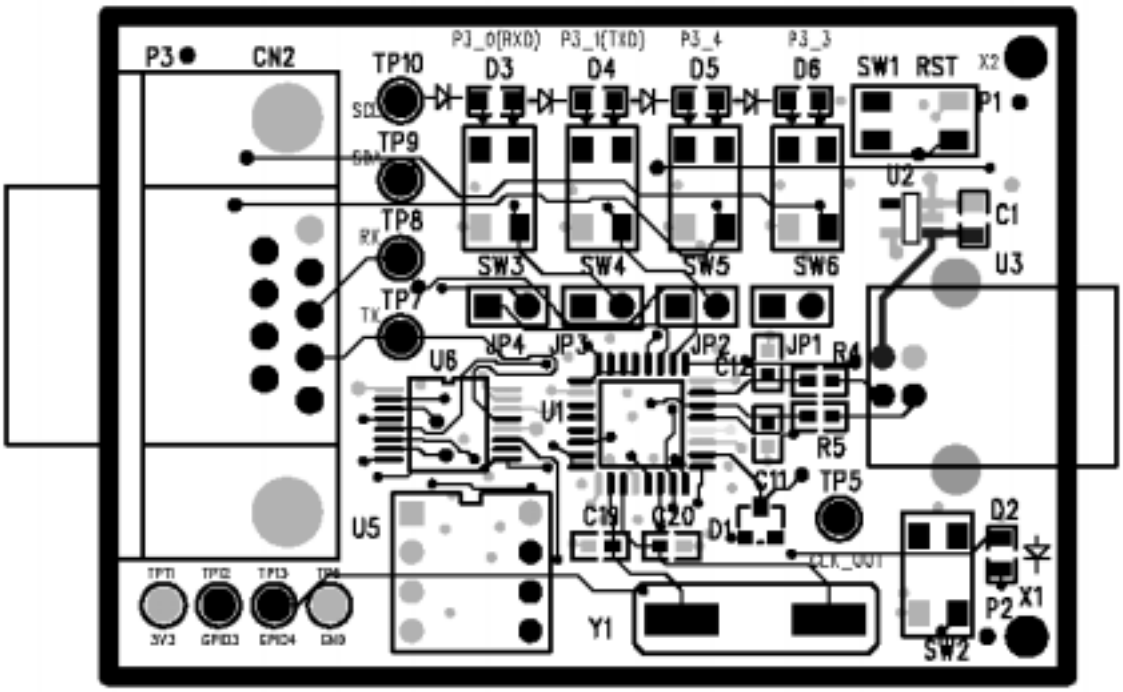
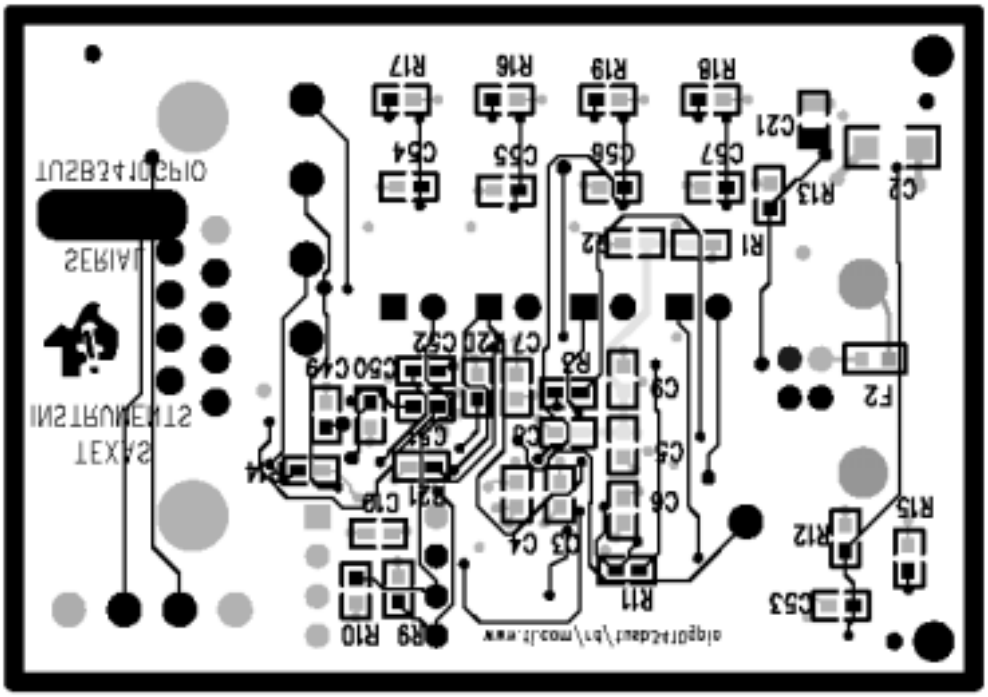
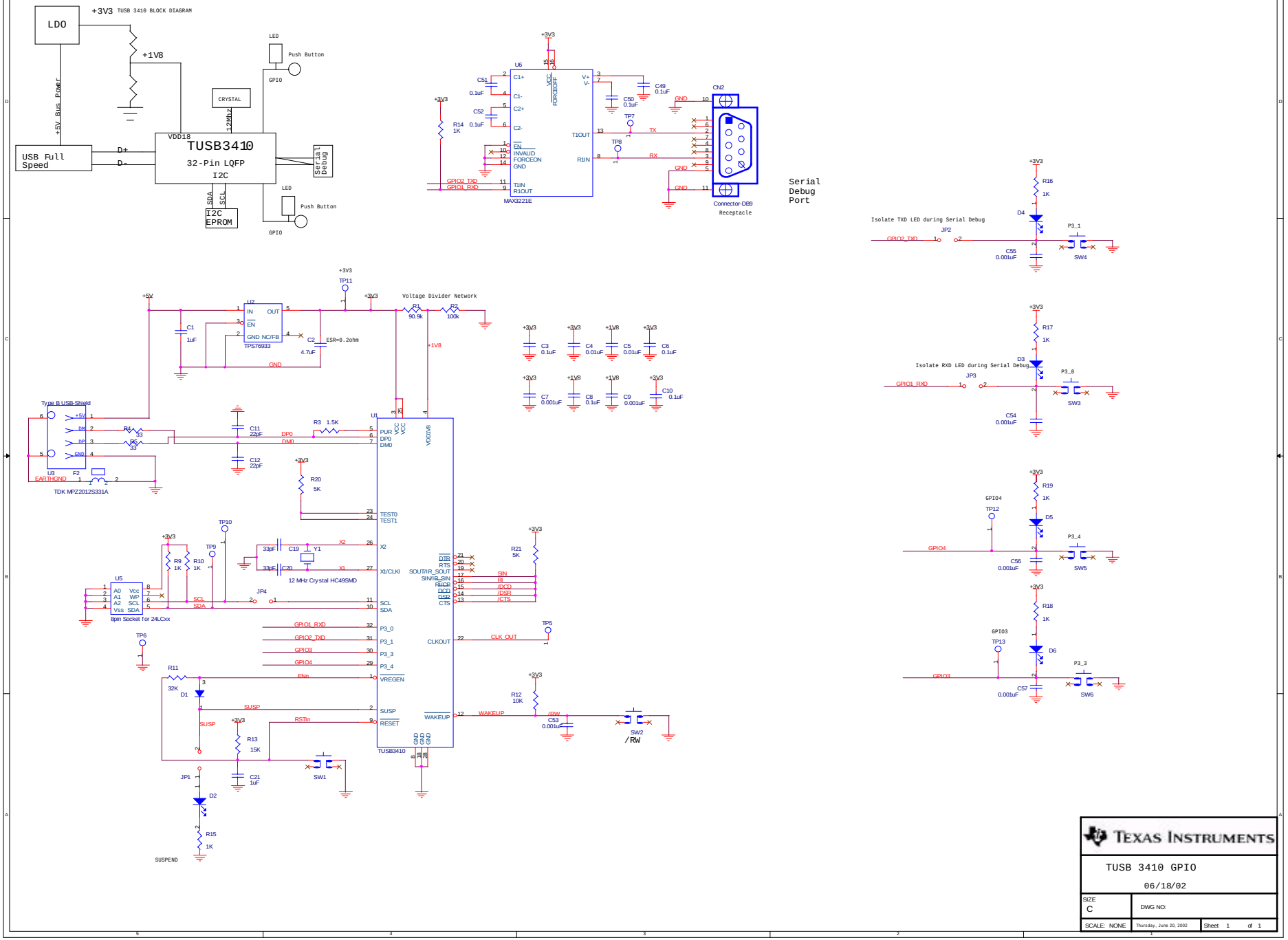


Figure 3–2. Bottom Layer



Appendix A

TUSB3410 GPIO EVM Schematic Diagram


+3V3 TUSB 3410 BLOCK DIAGRAM
LDO
+1V8
+5V Bus Power
CRYSTAL
12Mhz
VDD18
TUSB3410
32-Pin LQFP
I2C
USB Full Speed
D+
D-
SDA
SCL
I2C EPROM
LED
Push Button
GPIO
Serial Debug
LED
Push Button
GPIO
U6
C1+
C1-
C2+
C2-
VCC
V+
V-
FORCEOFF
EN
INVALID
FORCEON
GND
T1OUT
R1IN
T1IN
R1OUT
MAX3221E
C51 0.1uF
C52 0.1uF
C49 0.1uF
C50 0.1uF
R14 1K
TP7
TP8
TX
RX
GPIO2_TXD
GPIO1_RXD
CN2
Connector-DB9
Receptacle
Serial Debug Port
Isolate TXD LED during Serial Debug
JP2
D4
R16 1K
P3_1
SW4
C55 0.001uF
Isolate RXD LED during Serial Debug
JP3
D3
R17 1K
P3_0
SW3
C54 0.001uF
GPIO4
TP12
D5
R19 1K
P3_4
SW5
C56 0.001uF
GPIO3
TP13
D6
R18 1K
P3_3
SW6
C57 0.001uF
U2
IN
OUT
EN
GND NC/FB
TPS76933
C1 1uF
C2 4.7uF
ESR=0.2ohm
Voltage Divider Network
R1 90.9k
R2 100k
TP11
C3 0.1uF
C4 0.01uF
C5 0.01uF
C6 0.1uF
C7 0.001uF
C8 0.1uF
C9 0.001uF
C10 0.1uF
Type B USB Shield
U3
EARTHGND
F2
TDK MPZ2012S331A
R4 33
R5 33
C11 22pF
C12 22pF
R3 1.5K
R20 5K
U1
PUR
DP0
DM0
VCC
VDD3V6
TEST0
TEST1
X2
XI/CLKI
SCL
SDA
P3_0
P3_1
P3_3
P3_4
VREGEN
SUSP
RESET
WAKEUP
CLKOUT
DTR
RTS
SOUT/IR_SOUT
SIN/IR_SIN
RI/CP
DCD
DSR
CTS
SIN
RI
/DCD
/DSR
/CTS
CLK_OUT
TUSB3410
Y1
12 MHz Crystal HC49SMD
C19 33pF
C20 33pF
R9 1K
R10 1K
R21 5K
R12 10K
C53 0.001uF
SW2
/RW
U5
8pin Socket for 24LCxx
JP4
TP5
TP6
TP9
TP10
R11 32K
D1
SUSP
RSTIn
R13 15K
C21 1uF
SW1
JP1
D2
R15 1K
SUSPEND
ENo
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TUSB 3410 GPIO
06/18/02
SIZE C
DWG NO:
SCALE: NONE
Thursday, June 20, 2002
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