Texas Instruments

User's Guide

SBOU058A–March 2008–Revised February 2010

USB DIG Platform

This user's guide describes the characteristics, operation, and use of the USB DIG Platform. It provides a detailed description of the hardware design. The USB DIG Platform is used as part of several of Texas Instruments evaluation module kits; this document supplements the documentation of those evaluation module kits.

Contents

List of Figures

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I²C is a trademark of NXP Semiconductors.
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1 Overview

The USB DIG Platform is a data acquisition system that generates digital and analog signals. Specifically, the system generates I^2C™, SPI™, One-Wire, and general-purpose digital I/O signals. The system also contains four 16-bit string digital-to-analog converters (DACs), and two 16-bit delta-sigma (ΔΣ) analog-to-digital converters (ADCs).

In general, the USB DIG Platform is connected to a separate test board; these two components, along with the related cables and power supplies, form a complete evaluation module (EVM). An EVM facilitates the evaluation of a specific device. For example, the PGA308EVM contains the USB DIG Platform, the PGA308 test board, a power supply, and a USB cable. This EVM allows customers to evaluate and understand all the features on the PGA308 integrated circuit.

1.1 Hardware Included with a Typical USB DIG Platform

Figure 1 illustrates the typical hardware included the USB DIG Platform.

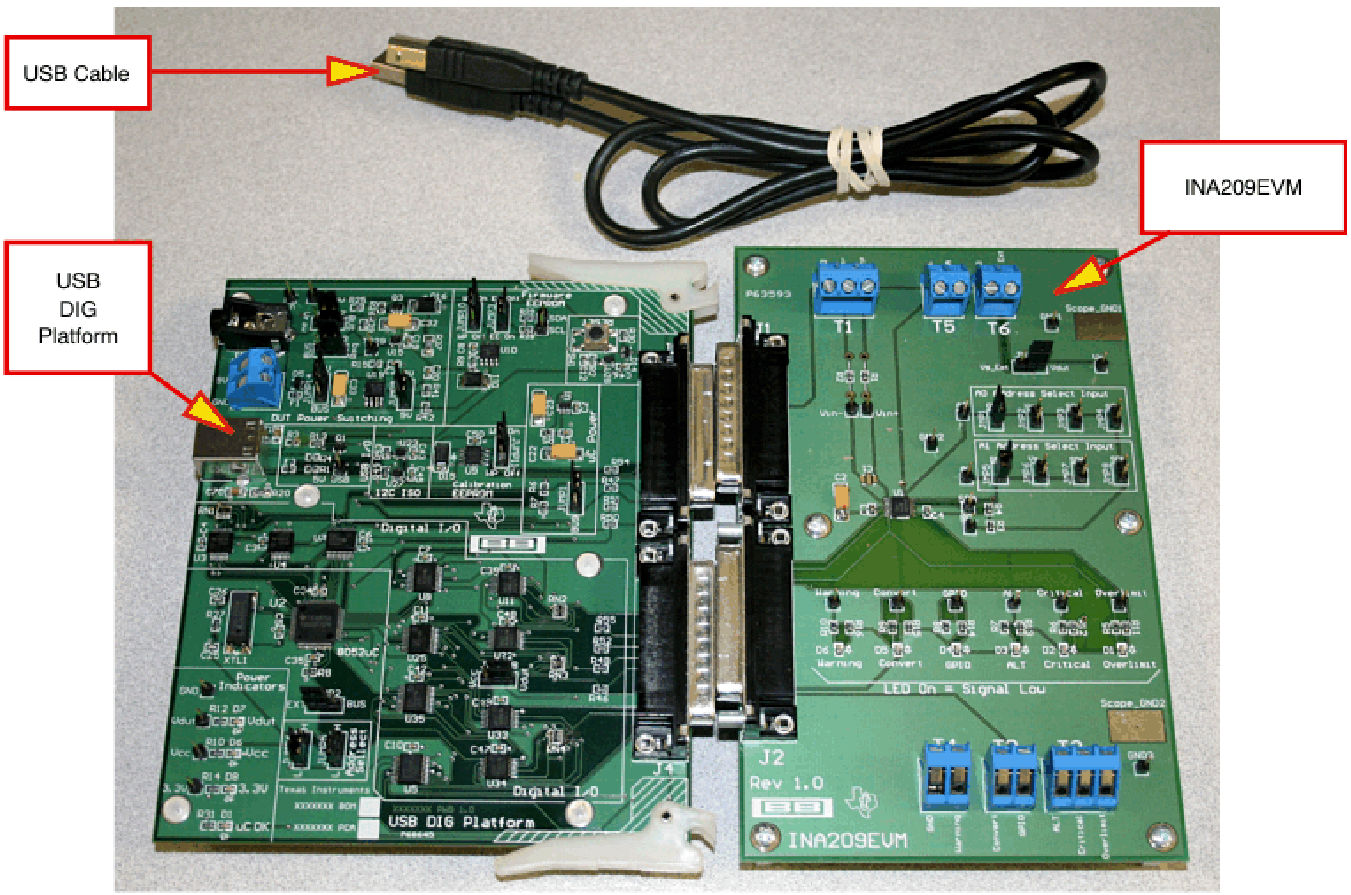

Figure 1. Typical Hardware Included with the USB DIG Platform

1.2 Related Documentation from Texas Instruments

Current versions of all documentation can be obtained from the TI website at http://www.ti.com/, or by calling the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center (PIC) at (972) 644-5580. When ordering, identify the document by both title and literature number.

1.3 If You Need Assistance

If you have questions about the INA209 evaluation module, contact the Linear Amplifiers Applications Team at precisionamps@list.ti.com. Include *USB DIG Platform* as the subject heading.

1.4 Information About Cautions and Warnings

This document contains caution statements.

> **CAUTION**
>
> This is an example of a caution statement. A caution statement describes a situation that could potentially damage your software or equipment.

The information in a caution or a warning is provided for your protection. Please read each caution and warning carefully.

1.5 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 is required to take whatever measures may be required to correct this interference.

2 System Setup

Figure 2 shows the typical system setup for the USB DIG Platform. The PC runs software that communicates with the USB DIG Platform, while the USB DIG Platform generates the digital signals used to communicate with the test board. Connectors on the test board are typically used to connect external signals to the device under test (DUT). Jumpers and other circuitry on the test board allow for different configurations of the DUT.

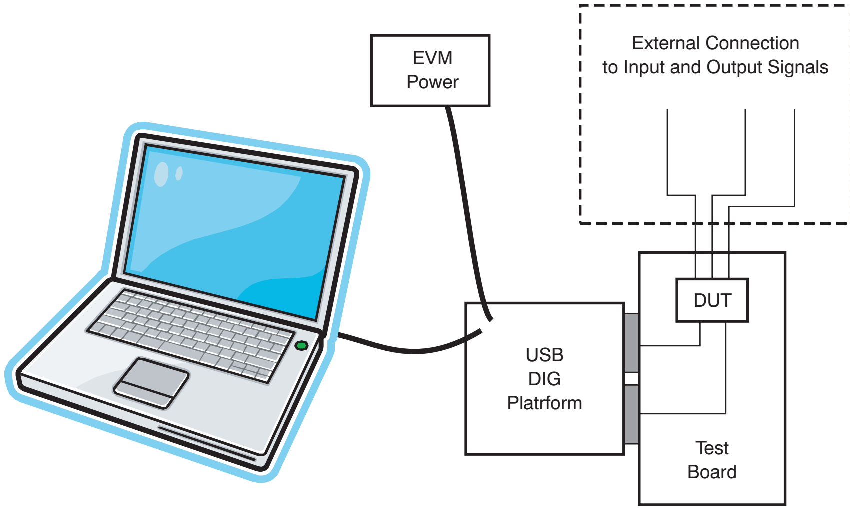

Figure 2. Hardware Setup for the USB DIG Platform

Minimim PC operating requirements:

- Microsoft Windows® XP or higher
- Available USB port

NOTE: Works with either US or European regional settings.

3 Theory of Operation

The USB DIG Platform is a general-purpose data acquisition system that is part of several different Texas Instruments EVMs. Figure 3 illustrates a block diagram of the platform.

The core of the USB DIG Platform is the TUSB3210, an 8052 microcontroller (μC) that has a built-in USB interface. The microcontroller receives information from the host computer that it translates into I^2C, SPI, or other digital I/O patterns. During the digital I/O transaction, the microcontroller reads the response of any device connected to the I/O interface. The response from the device is then sent back to the PC where it is interpreted by the host computer.

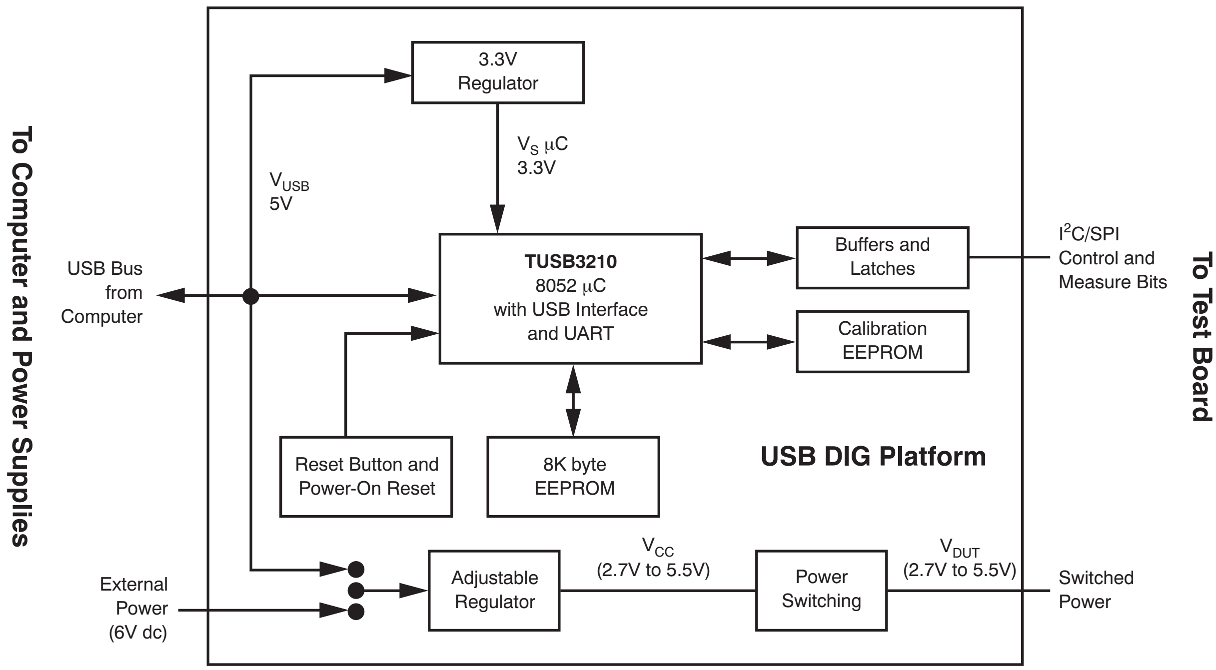

Figure 3. USB DIG Platform Block Diagram

3.1 Digital I/O Area

The following subsections discuss the digital I/O areas that surround the microcontroller. Refer to SBOR002 (available for download from www.ti.com) for a detailed copy of the entire schematic.

3.1.1 Microcontroller

Figure 4 shows the detailed area surrounding the microcontroller. U2 is a TUSB3210 microcontroller—an 8052 core with a built-in USB interface. U2 converts information from the USB bus on the PC to I^{2}C, SPI, and One-Wire digital transactions. U2 runs on 3.3V; the inputs are not 5V tolerant. As a result, all external input signals are level-translated. JUMP2 allows U2 to be powered from the USB bus or the external supply.

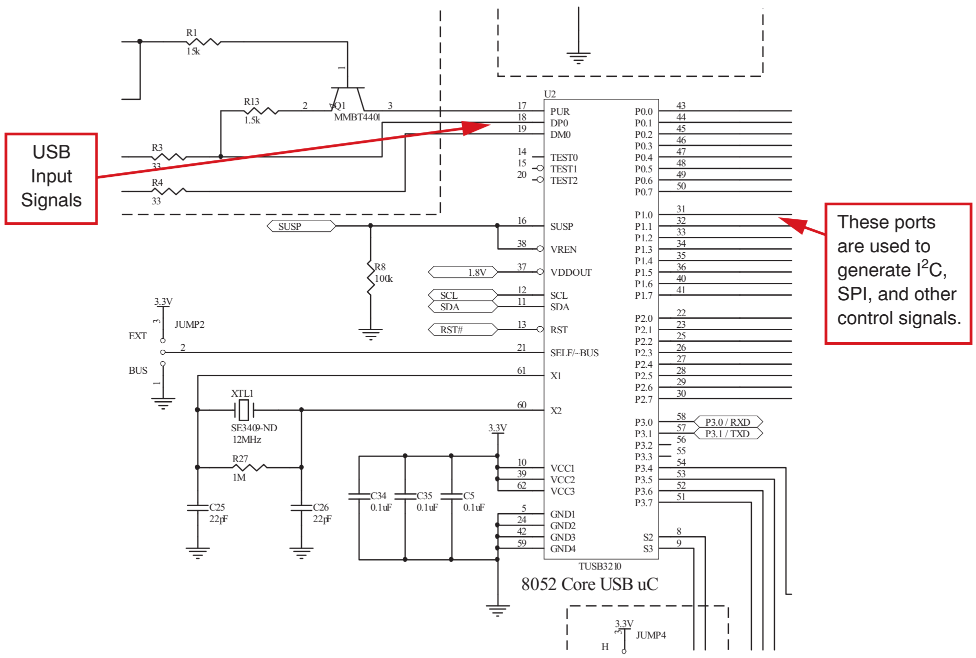

Figure 4. Digital I/O Area—Microcontroller

3.1.2 I²C and SPI

Figure 5 shows the digital I/O area that manages I²C and SPI communications. U3 and U4 are open collector drivers. These devices drive the I²C and SPI output signals. Note that the input is 3.3V and the output follows V_{DUT} (that is, 3V or 5V). U7 is the input buffer. Note that the inputs are 5V tolerant. The outputs of U7 are compatible with the microcontroller (that is, 3.3V).

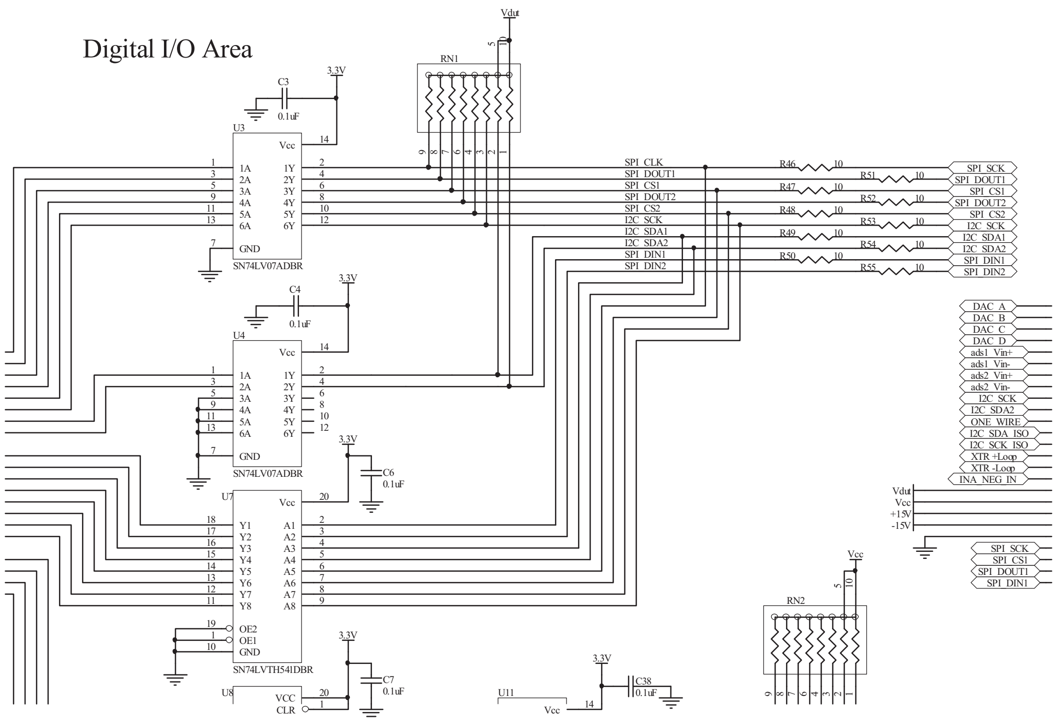

Figure 5. Digital I/O Area—I²C and SPI

3.1.3 Internal Control Signals

Figure 6 shows the digital I/O area used for internal control (for example, calibration mux control). U8 is used to latch the internal control signals. A latch is required because microcontroller port 2 is used for multiple purposes. U11 is an open collector buffer that converts the control signals to V_{DUT} logic levels (that is, 3V or 5V). U25 and U22 perform the same function as U8 and U11, respectively.

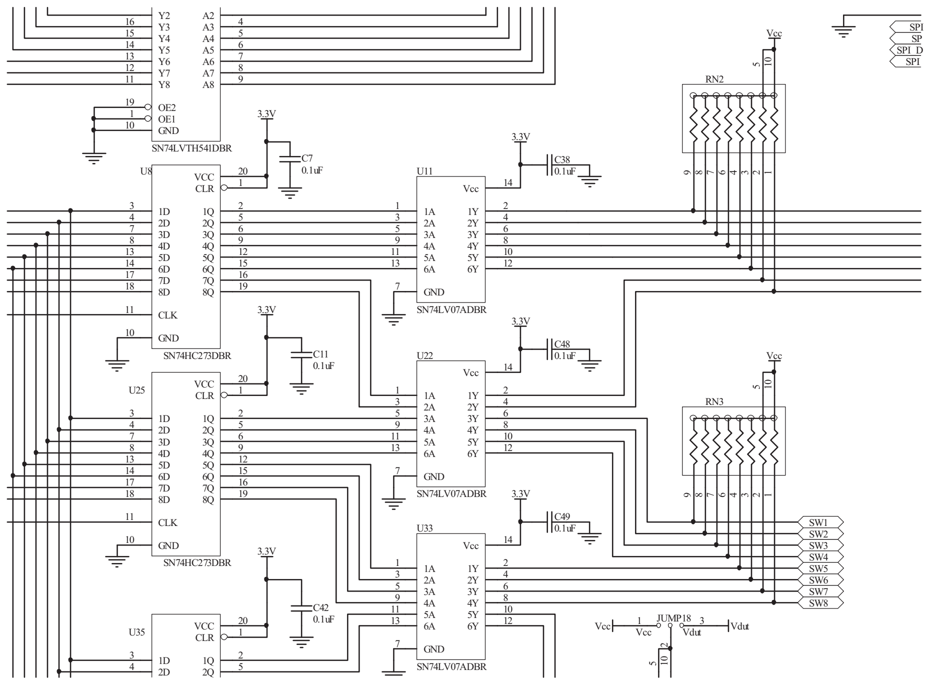

Figure 6. Digital I/O Area—Internal Control Signals

3.1.4 CTRL and MEAS

Figure 7 shows the connection of the CTRL and MEAS circuitry. U34 is the latch for the general-purpose output (CTRL1 to CTRL8). U5 is the buffer for the general-purpose input (MEAS1 to MEAS8).

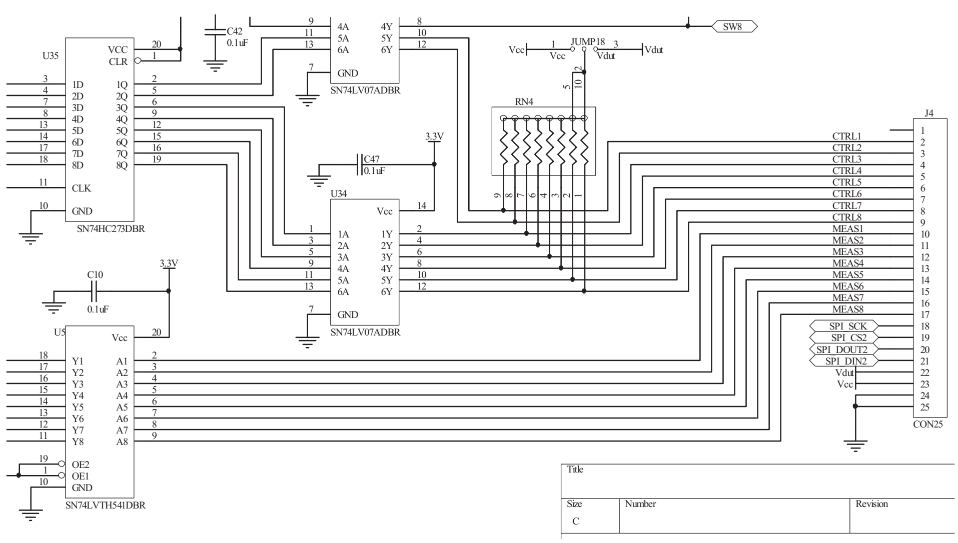

Figure 7. Digital I/O Area—CTRL and MEAS

3.1.5 Address Select

Figure 8 shows the jumper connections that set the USB address. JUMP4 and JUMP5 allow for different USB product IDs. The product IDs are called *addresses* because they effectively act as USB addresses.

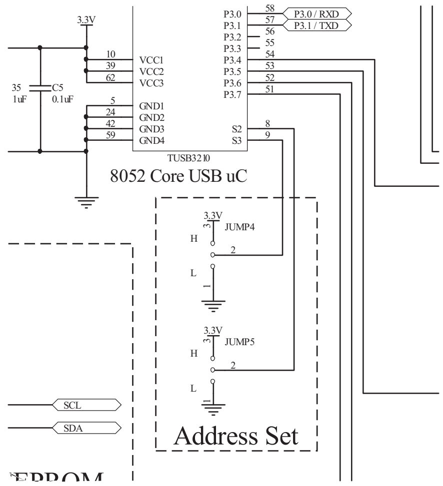

Figure 8. Digital I/O Area—Address Select

3.2 *Microcontroller Power*

Figure 9 shows the power connections to the microcontroller. U1 provides the 3.3V supply for the TUSB3210 microcontroller. JUMP1 selects the power source: EXT = External 9V dc power, BUS = 5V power from USB.

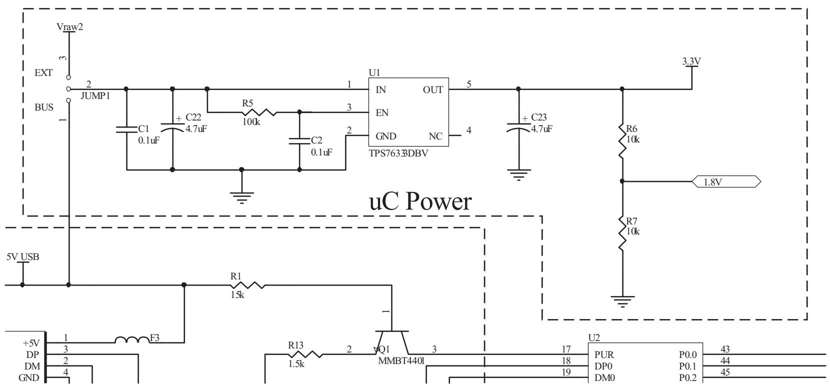

Figure 9. Microcontroller Power

3.3 USB I/O

Figure 10 shows the USB port connection to the microcontroller. J1 connects the USB bus to the TUSB3210 microcontroller. The transistor and resistors are standard support circuitry for this device. See the TUSB3210 data sheet (SLLS466F), available from www.ti.com, for more information.

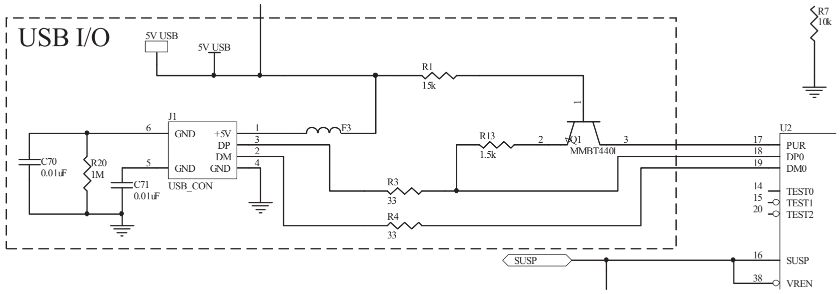

Figure 10. USB I/O

3.4 Firmware EEPROM

Figure 11 shows the firmware EEPROM area. U10 is the 8K-byte EEPROM that contains the firmware program used to run the microcontroller. JUMP3 allows the EEPROM to be disconnected from the microcontroller (EE OFF). The EE OFF feature is only used by the factory during EEPROM programming. This jumper must be in the EE ON position for normal operation.

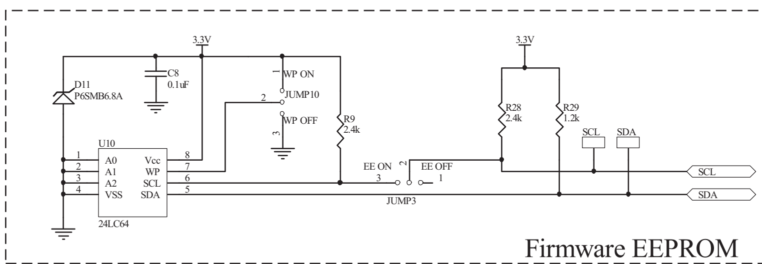

Figure 11. Firmware EEPROM

3.5 Power Indicators

Figure 12 shows the LED power indicators. The LEDs are used to indicate DUT power, 3V power, and microcontroller status. The LEDs labeled V_{CC} , *uC OK*, and *3.3V* should be on when the system is powered up. V_{DUT} is switched power and can be turned on and off with software.

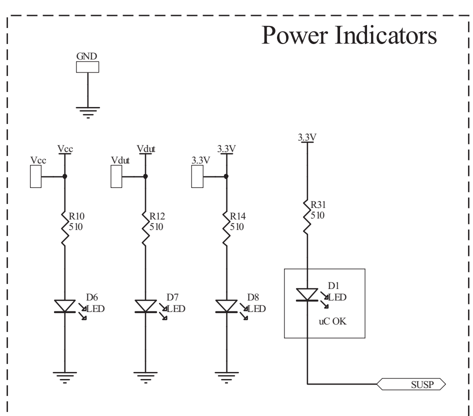

Figure 12. Power Indicators

3.6 Reset

Figure 13 shows the microcontroller reset circuitry. The reset circuit is connected to the $\overline{RST}$ pin on the microcontroller and resets the microcontroller upon power-up. U28 is a Schmitt buffer that is used to create a clean logic high or low (that is, the $\overline{RST}$ pin is connected to 3.3V or 0V and not to intermediate voltage levels).

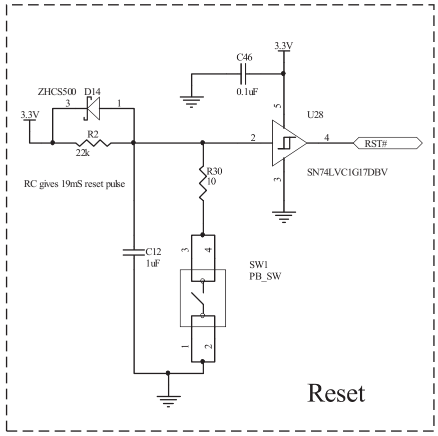

Figure 13. Reset

3.7 DUT Power Switching

Figure 14 shows the DUT power switching. U19 is an adjustable regulator. JUMP9 controls the output of U19; the output of U19 can be set to either 5V or 3V. Q3 switches the power on or off. The supply before the switch is called V_{CC}, and is a constant 3V or 5V. The supply after the switch is called V_{DUT} and is a switched 3V or 5V (that is, it can be disconnected). U15 is used to discharge any capacitance connected to V_{DUT} after it is disconnected.

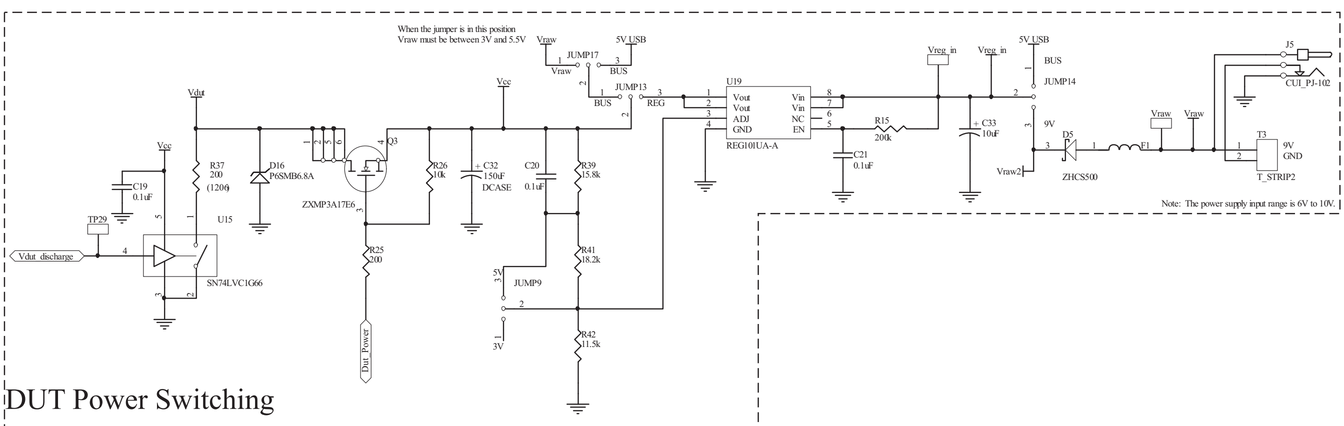

Figure 14. DUT Power Switching

3.8 I²C Isolation

Figure 15 shows the switches that isolate the I²C communication lines. U27 and U23 are used to connect or disconnect the I²C bus.

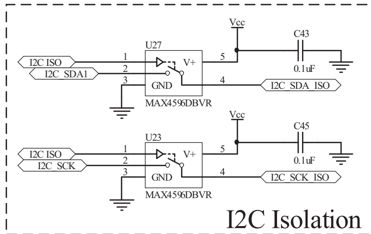

Figure 15. I²C Isolation

3.9 Calibration EEPROM

Figure 16 shows the EEPROM that contains calibration information. U9 is a 8K-byte EEPROM. Calibration information (that is, slopes and offsets) for the DACs and ADCs is stored in U9. The USB DIG Platform is calibrated at the factory. After calibration, JUMP11 is used to write-protect the EEPROM (that is, JUMP11 = WP ON).

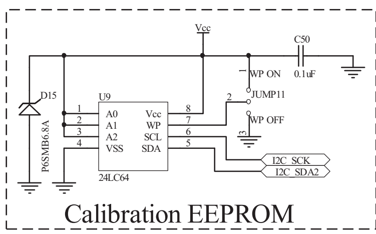

Figure 16. Calibration EEPROM

3.10 Default Jumper Settings

3.10.1 5V

Figure 17 shows the jumper settings for the most common USB DIG Platform configuration. This setup is the jumper setting configuration that is shipped from the factory. In this configuration, the digital I/O, DACs, and ADCs are all referenced to 5V. This configuration also uses an external 6V dc supply to provide power for the digital I/O. It is possible to use the USB bus to power the USB DIG Platform. However, it is not recommended because the USB bus power is noisier than the external power supply, has limited current, and does not have the headroom required to run the 5V reference.

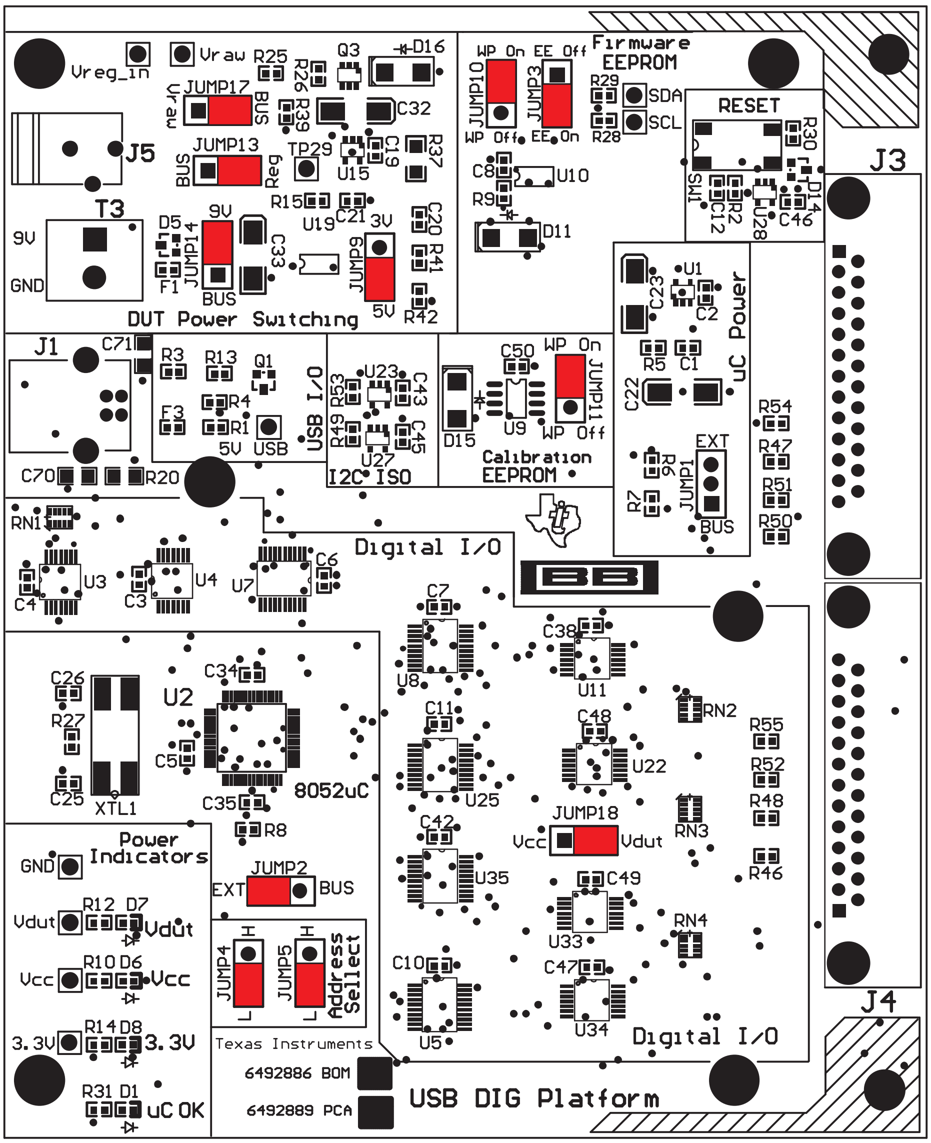

Figure 17. 5V Default Jumper Settings

3.10.2 3V

Figure 18 shows the jumper settings for another typical USB DIG Platform configuration. In this configuration, the digital I/O has 3V levels and the DACs and ADCs are also referenced to 3V. This configuration uses an external 6V dc supply to provide power for the digital I/O. It is possible to use the USB bus to power the USB DIG Platform. However, it is not recommended because the USB bus power is noisier than the external power supply, has limited current, and does not have the headroom required to run the 3V reference.

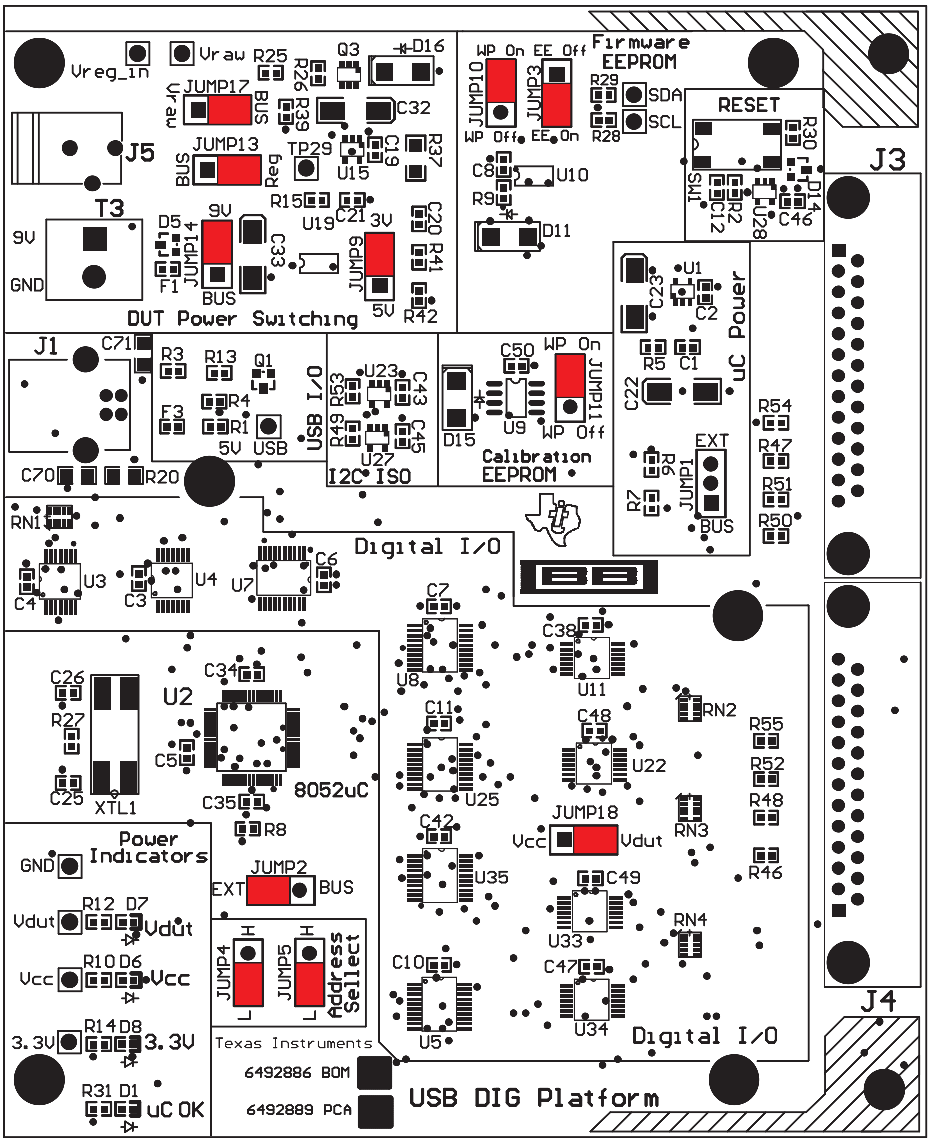

Figure 18. 3V Default Jumper Settings

4 Detailed Description of Jumper Settings

Table 1 to Table 6 show the detailed description of jumpers on the USB DIG Platform. In most cases, it is easiest to use the typical setting described in Figure 17 or Figure 18. However, for some specific cases it may be useful to create a custom jumper setting using the information in Table 1 to Table 6.

Table 1. Power-Supply Jumper Configuration #1

Mode	Jumper	Comment
External Power—5V (default jumper settings)	JUMP17 = BUS (not used) JUMP13 = REG JUMP14 = 9V JUMP1 = EXT JUMP2 = EXT JUMP6 = 5V JUMP7 = REF	In this mode, all power is supplied to the EVM via J5 or T3. The external supply must be between 5.8V and 10.4V for proper operation. All digital I/Os are regulated to 5V using U19 (REG101).
External Power—3V (typical jumper settings)	JUMP17 = BUS (not used) JUMP13 = REG JUMP14 = 9V JUMP1 = EXT JUMP2 = EXT JUMP6 = 3V JUMP7 = REF	In this mode, all power is supplied to the EVM via J5 or T3. The external supply must be between 5.8V and 10.4V for proper operation. All digital I/Os are regulated to 3V using U19 (REG101).
External Power—Variable Supply	JUMP17 = Vraw JUMP13 = BUS JUMP14 = 9V (not used) JUMP1 = EXT JUMP2 = EXT JUMP6 = 5V (not used) JUMP7 = REG (ratiometric mode)	In this mode, all the digital I/Os are referenced to the supply that is attached to either J5 or T3. **CAUTION** It is absolutely critical that the supply voltage does not exceed 5.5V in this mode. The supply is directly applied to devices with 5.5V absolute maximum ratings. This mode of operation is useful when a device supply other then 3.0V or 5.0V is required.

Table 2. Power-Supply Jumper Configuration #2

Mode	Jumper	Comment
Bus Power—5V	JUMP17 = BUS JUMP13 = BUS JUMP14 = 9V (not used) JUMP1 = BUS JUMP2 = BUS JUMP6 = 5V (not used) JUMP7 = REG (ratiometric mode, 5V supply)	In this mode, the USB bus completely powers the EVM. The USB bus is regulated by the master (computer) to be 5V. This mode relies upon external regulation. This mode is recommended only when an external 9V supply is not available. If an external 9V supply is available, use either *External Power 5V* mode or *External Power 3V* mode.
Bus Power—3V	JUMP17 = BUS (not used) JUMP13 = REG JUMP14 = BUS JUMP1 = BUS JUMP2 = BUS JUMP6 = 3V JUMP7 = REG (ratiometric mode, 5V supply)	In this mode, the USB bus completely powers the EVM. The regulator (U19, REG101) is used to generate a 3V supply for all digital I/O.

Table 3. Address Select

Address (Product ID or PID)	Jumper Setting	Comment
0x1234	JUMP4 = L JUMP5 = L	This address is the default.
0x1235	JUMP4 = L JUMP5 = L	
0x1236	JUMP4 = L JUMP5 = L	
0x1237	JUMP4 = L JUMP5 = L	

Table 4. EEPROM Jumpers

Jumper Setting	Comment
JUMP3 = EE On (default)	This position is the default setup for USB DIG Platform users. This position allows the TUSB3210 microcontroller to load the USB DIG Platform firmware upon power-up or reset. The other position (EE Off) is used for development or firmware update.
JUMP3 = EE Off	This position disconnects the EEPROM from the TUSB3210 microcontroller. This mode of operation allows new firmware to be loaded from the host computer to the USB DIG Platform using the Texas Instruments Apploader driver (SLLC160). Note that this mode of operation is only used during firmware development.
JUMP10 = WP On	Prevents accidental overwrite of the firmware (normal position).
JUMP10 = WP Off	Allows for writing new firmware (normally done at factory).

EE On is the default position. This jumper is typically only used in factory EEPROM programming. In order to write new firmware into the EEPROM, the USB DIG Platform must be connected to the host computer with the jumper in the *EE Off* position. Once the USB device has been detected, the jumper position must be changed to the *EE On* position. After the jumper position is changed, the EEPROM Burner software may be used to copy new firmware onto the USB DIG Platform.

The following procedure describes the procedure for programming the EEPROM:

1. JUMP3 = EE Off, JUMP10 = WP Off.
   (a) Connect power.
   (b) Connect the USB cable.
   (c) Press the reset button.
2. JUMP3 = EE On, JUMP10 = WP Off.
   (a) Program the EEPROM.
3. JUMP3 = EE On, JUMP10 = WP On.
   (a) Press the reset button.
   (b) The programming procedure is complete. Test the module.

Table 5. V_{CC}/V_{DUT} Jumper

Jumper Setting	Comment
JUMP18 = V_{DUT}	The digital output (CTRL1 to CTRL8) pull-up resistor is connected to V_{DUT}, a switched power supply of 3V or 5V. This mode of operation is most useful when the digital outputs are connected directly to the device under test (DUT). Thus, if the DUT power supply is turned off, the digital signals connected to the DUT are also turned off.
JUMP18 = V_{CC}	The digital output (CTRL1 to CTRL8) pull-up resistor is connected to V_{CC}, a constant power supply of 3V or 5V. This mode of operation is most useful when the digital outputs are connected to control circuitry that must remain configured regardless of the DUT supply status. For example, this mode would be used when an analog multiplexer is connected to the DUT, and the DUT power must be cycled without affecting the multiplexer configuration.

Table 6. Calibration EEPROM Jumper

Jumper Setting	Comment
JUMP11 = WP_On	Prevents accidental overwrite of calibration constants (default position).
JUMP11 = WP_Off	Allows rewriting of calibration constants (recalibration).

4.1 Connector Definition

Figure 19 gives a functional description of the different connectors on the USB DIG Platform.

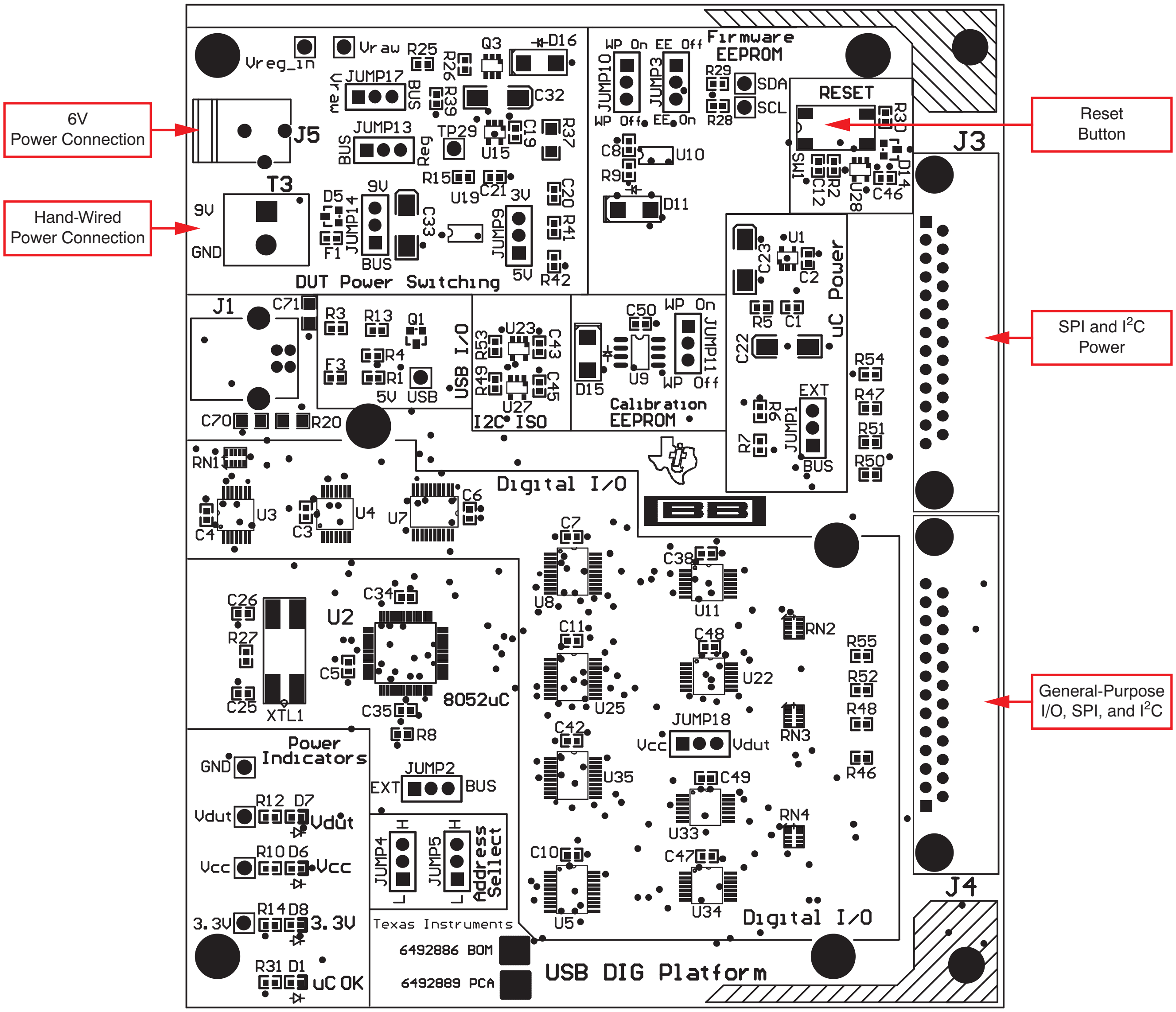

Figure 19. Connector Definition

4.2 Signal Definition of J3 (25-pin Female DSUB)

Table 7 shows the different signals connected to J3 on the USB DIG Platform, and gives a description of each signal.

Table 7. Signal Definition of J3 (25-pin Female DSUB)

Pin on J1	Signal	Description
1	NC	No connection
2	NC	No connection
3	NC	No connection
4	NC	No connection
5	NC	No connection
6	NC	No connection
7	NC	No connection
8	NC	No connection
9	I2C_SCK	I^2C clock signal (SCL) channel 1
10	I2C_SDA2	I^2C data signal (SDA) channel 1
11	NC	No connection
12	I2C_SCK_ISO	I^2C clock signal (SCL) channel 1; can be disconnected using a switch
13	I2C_SDA_ISO	I^2C data signal (SCL) channel 1; can be disconnected using a switch
14	NC	No connection
15	NC	No connection
16	NC	No connection
17	V_{DUT}	Switched 3V or 5V power. Note that when power is switched off, the digital I/O is also switched off.
18	V_{CC}	This supply is the same voltage as V_{DUT}, but is not switched. For example, if V_{DUT} = 3V, then V_{CC} =3V; however, V_{CC} does not change when V_{DUT} is turned off.
19	NC	No connection
20	NC	No connection
21	GND	Common or ground connection for power.
22	SPI_SCK	SPI clock signal for channel 1
23	SPI_CS1	SPI chip select for channel 1
24	SPI_DOUT	SPI data output for channel 1
25	SPI_DIN1	SPI data input for channel 1

4.3 Signal Definition of J4 (25-pin Male DSUB)

Table 8 shows the different signals connected to J4 on the USB DIG Platform and gives a description of each signal.

Table 8. Signal Definition of J4 (25-pin Male DSUB)

Pin on J1	Signal	Description
1	NC	No connection
2	CTRL1	Digital output or control line (1 of 8)
3	CTRL2	Digital output or control line (2 of 8)
4	CTRL3	Digital output or control line (3 of 8)
5	CTRL4	Digital output or control line (4 of 8)
6	CTRL5	Digital output or control line (5 of 8)
7	CTRL6	Digital output or control line (6 of 8)
8	CTRL7	Digital output or control line (7 of 8)
9	CTRL8	Digital output or control line (8 of 8)
10	MEAS1	Digital input or measure line (1 of 8)
11	MEAS2	Digital input or measure line (2 of 8)
12	MEAS3	Digital input or measure line (3 of 8)
13	MEAS4	Digital input or measure line (4 of 8)
14	MEAS5	Digital input or measure line (5 of 8)
15	MEAS6	Digital input or measure line (6 of 8)
16	MEAS7	Digital input or measure line (7 of 8)
17	MEAS8	Digital input or measure line (8 of 8)
18	SPI_SCK	SPI clock for channel 2 (note this signal is shared for both channels)
19	SPI_CS2	SPI chip select for channel 2
20	SPI_DOUT2	SPI data output for channel 2
21	SPI_DIN2	SPI data input for channel 2
22	V_{DUT}	Switched 3V or 5V power. Note that when power is switched off, the digital I/O is also switched off.
23	V_{CC}	This supply is the same voltage as V_{DUT}, but is not switched. For example, if V_{DUT} = 3V, then V_{cc} =3V; however, V_{CC} does not change when V_{DUT} is turned off.
24	GND	Common or ground connection for power
25	GND	Common or ground connection for power

5 Bill of Materials

Table 9 shows the parts list.

Table 9. Bill of Materials

Qty	Value	Ref Des	Description	Vendor	Part Number
1	15kΩ	R1	RES 15.0K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1502V
1	22kΩ	R2	RES 22.0K OHM 1/10W 1% 0603 SMD	Yageo America	RC0603FR-0722KL
2	100kΩ	R5, R8	RES 100K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1003V
3	10kΩ	R6, R7, R26	RES 10.0K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1002V
2	33Ω	R3, R4	RES 33.0 OHM 1/10W 1% 0603 SMD	Yageo America	RC0603FR-0733RL
1	1MΩ	R27	RES 1.00M OHM 1/10W 1% 0603 SMD	Yageo America	RC0603FR-071ML
1	1.5kΩ	R13	RES 1.50K OHM 1/10W 1% 0603 SMD	Yageo America	RC0603FR-071K5L
12	10Ω	R30, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55	RES 10.0 OHM 1/10W 1% 0603 SMD	Yageo America	RC0603FR-0710RL
4	510Ω	R10, R12, R14, R31	RES 510 OHM 1/10W 1% 0603 SMD	Yageo America	RC0603FR-07510RL
1	1.2kΩ	R29	RES 1.20K OHM 1/10W 1% 0603 SMD	Yageo America	RC0603FR-071K2L
1	200Ω	R37	RES 200 OHM 1/4W 1% 1206 SMD	Yageo America	RC1206FR-07200RL
1	200Ω	R25	RES 200 OHM 1/10W 1% 0603 SMD	Yageo America	RC0603FR-07200RL
1	15.8kΩ	R39	RES 15.8K OHM 1/10W 1% 0603 SMD	Yageo America	RC0603FR-0715K8L
1	18.2kΩ	R41	RES 18.2K OHM 1/10W 1% 0603 SMD	Vishay/Dale	CRCW060318K2FKEA
1	11.5kΩ	R42	RES 11.5K OHM 1/10W 1% 0603 SMD	Yageo Corporation	RC0603FR-0711K5L
1	200kΩ	R15	RES 200K OHM 1/10W 1% 0603 SMD	Yageo America	RC0603FR-07200KL
2	2.4kΩ	R9, R28	RES 2.40K OHM 1/10W 1% 0603 SMD	Yageo America	RC0603FR-072K4L
1	1M	R20	RES 1.00M OHM 1/4W 1% 1206 SMD	Yageo Corporation	RC1206FR-071ML
4	4.7kΩ	RN1, RN2, RN3, RN4	RES ARRAY 4.7KOHM 10TRM BUSS SMD	CTS Corporation	746X101472JP
1	1M	R20	RES 1.00M OHM 1/10W 1% 0603 SMD	YAGEO	RC0603FR-071ML
2	4.7kΩ	C22, C23	CAPACITOR TANT 4.7UF 25V 10% SMD 6032-28 (EIA)	Kemet	T491C475K025AT
24	0.1μF	C1, C2, C3, C4, C5, C6, C7, C8, C10, C11, C19, C20, C21, C34, C35, C38, C42, C43, C45, C46, C47, C48, C49, C50	CAP .10UF 25V CERAMIC Y5V 0603	Kemet	C0603C104M3VACTU
1	1μF	C12	CAP 1UF 25V CERAMIC 0603 X5S	Panasonic - ECG	ECJ-1V41E105M
1	10μF	C33	CAP TANTALUM 10UF 25V 20% SMD	EPCOS Inc	B45196H5106M309
1	150μF	C32	CAP TANTALUM 150UF 10V 10% SMD	AVX Corporation	TAJC157K010R
2	22pF	C25, C26	CAP CERAMIC 22PF 50V NP0 0603	Yageo America	CC0603JRNPO9BN220
2	0.1μF	C70, C71	CAP CERAMIC .01UF 500V X7R 1206	Kemet	C1206C103KCRACTU
1		U1	IC 3.3V 150MA LDO REG SOT-23-5	Texas Instruments	TPS76333DBVT
1		U2	IC USB CNTRLR STORAGE 64-LQFP	Texas Instruments	TUSB3210PM
6		U3, U4, U11, U22, U33, U34	IC HEX BUFF/DRV W/OD 14-SSOP	Texas Instruments	SN74LV07ADBR
2		U9, U10	IC SERIAL EEPROM 64K 2.5V 8-SOIC	Texas Instruments	24LC64-I/SN
2		U5, U7	IC OCT BUFF/DRVR TRI-ST 20-SSOP	Texas Instruments	SN74LVTH541DBR
3		U8, U25, U35	IC OCT D-TYPE F-F W/CLR 20-SSOP	Texas Instruments	SN74HC273DBR
1		U15	IC BILATERL ANALOG SWTCH SOT23-5	Texas Instruments	SN74LVC1G66DBVR

Table 9. Bill of Materials (continued)

Qty	Value	Ref Des	Description	Vendor	Part Number
1		U19	IC LDO REG ADJ 100MA 8-SOIC	Texas Instruments	REG101UA-A
2		U23, U27	IC ANALOG SWITCH 5V SOT23-5	Texas Instruments	MAX4596DBVR
1		U28	IC SCHMITT-TRIG BUFF SOT-23-5	Texas Instruments	SN74LVC1G17DBVR
1	12MHz	XTL1	CRYSTAL 12.0000MHZ 18PF SMD	Epson Electronics America Inc	MA-505 12.0000M-C0:ROHS
1		J1	CONN SOCKET USB B-TYPE HORZ	Keystone Electronics	924
1		T3	2-Position Terminal Strip, Cage Clamp, 45º, 15A, Dove-tailed	On-Shore Technology Inc	ED300/2
1		J4	CONN D-SUB PLUG R/A 25POS 30GOLD (With Threaded Inserts and Board locks)	AMP/Tyco Electronics	5747842-4
1		J3	CONN D-SUB RCPT R/A 25POS 30GOLD (With Threaded Inserts and Board locks)	AMP/Tyco Electronics	5747846-4
1		J5	CONN PWR JACK 2.5X5.5MM HIGH CUR	CUI Inc	PJ-102BH
4		D1, D7, D6, D8	Ultra Bright Red Diffused LED, 0603 pkg	Panasonic	LNJ208R8ARA
3	6.8V Transorb	D11, D15, D16	TVS ZENER UNIDIR 600W 6.8V SMB	ON Semiconductor	P6SMB6.8AT3G
2		D5, D14	SOT-23 Schottky Diode, 500mA, 40V	Zetex Semiconductors	ZHCS500
1		Q1	TRANSISTOR GP NPN AMP SOT-23	Fairchild Semiconductor	MMBT4401
1		Q3	30V P-Channel Enhancement Mode MOSFET, SOT23-6	Zetex Semiconductors	ZXMP3A17E6
4		F1, F3, F4, F5	FERRITE 300MA 600 OHM 0603 SMD	Steward	HZ0603C601R-10
1		SW1	SWITCH TACT 6MM SMD GULL WING	Alcoswitch/Tyco Electronics	FSM2JSMA
20		TP20, TP21, TP22, TP23, TP24, TP25, TP26,TP27, TP28, TP29, AVcc, Vraw, Vreg_in, Vcc, Vdut, 3.3V, GND, 5V_USB, SDA, SCL	CONN HEADER .100 SNGL STR 36POS (cut into single position test points)	3M/ESD	929647-09-36-I
11		JUMP1, JUMP2, JUMP3, JUMP4, JUMP5, JUMP6, JUMP8, JUMP13, JUMP14, JUMP17, JUMP18	CONN HEADER .100 SNGL STR 36POS (cut into two position jumpers)	3M/ESD	929647-09-36-I
11		Jumpers for JUMP1, JUMP2, JUMP3, JUMP4, JUMP5, JUMP6, JUMP8, JUMP13, JUMP14, JUMP17, JUMP18	Jumper Shorting Units	AMP/Tyco Electronics	881545-2
6		NA	Standoffs, Hex , 4-40 Threaded, 0.500" length, 0.250" OD, Aluminum Iridite Finish	Keystone	2203
7		NA	SCREW MACHINE PHIL 4-40X1/4 SS	Building Fasteners	PMSSS 440 0025 PH
2		NA	PCB EXTRACTOR	Bivar	1001-062
2		NA	PIN FOR PCB EXTRACTOR	Bivar	RP-250

Revision History

Changes from Original (March, 2008) to A Revision	**Page**
• Updated Table 1	15
• Revised Table 2	15

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 5.7V (min) to 9V (max) and the output voltage range of 0V (min) to 5V (max).

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 +25°C. The EVM is designed to operate properly with certain components above +25°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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