BUF08500EVM Evaluation Board and Software Tutorial

This user's guide describes the characteristics, operation, and use of the BUF08500EVM evaluation board. It discusses how to set up and configure the software and hardware and reviews various aspects of the program operation. Throughout this document, the terms *evaluation board*, *evaluation module*, and *EVM* are synonymous with the BUF08500EVM. This user's guide also includes information regarding operating procedures and input/output connections, an electrical schematic, PCB layout drawings, and a parts list for the EVM.

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1 Overview

The BUF08500 is a low-output-impedance programmable gamma voltage generator. This device offers a bank of eight double-buffered programmable gamma channels, with an individual digital-to-analog conversion (DAC) output impedance of 250 kΩ. The BUF08500EVM is a platform for evaluating the performance of the BUF08500 under various signal, reference, and supply conditions.

This document gives a general overview of the BUF08500EVM and provides a general description of the features and functions to be considered while using this evaluation module.

1.1 BUF08500EVM Kit Contents

Table 1 summarizes the contents of the BUF08500EVM kit. Figure 1 shows all of the included hardware. Contact the Texas Instruments Product Information Center nearest you if any component is missing. It is highly recommended that you also check the BUF08500 product folder on the TI web site at www.ti.com to verify that you have the latest versions of the related software.

Table 1. BUF08500EVM Kit Contents

Item	Quantity
BUF08500EVM PCB Test Board	1
SM-USB-DIG Platform PCB	1
USB Extender Cable	1
SM-USB-DIG Connector Ribbon Cable	1
User's Guide CD-ROM	1

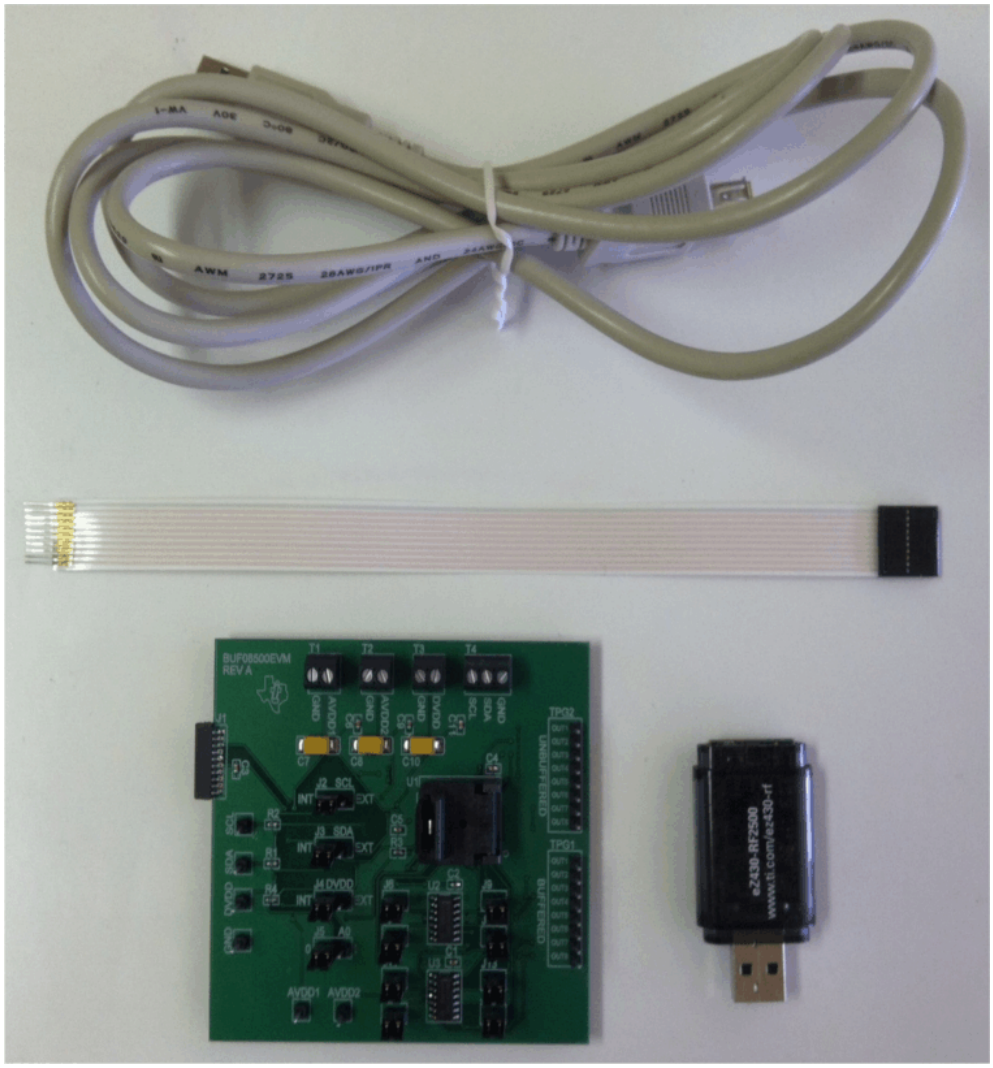


Figure 1. Hardware Included with BUF08500EVM Kit

1.2 Related Documentation from Texas Instruments

The following documents provide information regarding Texas Instruments' integrated circuits used in the assembly of the BUF08500EVM. This user's guide is available from the TI web site under literature number ***SBOU111***. Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions may be available from the TI web site, or call the Texas Instruments' Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number.

Table 2. Related Documentation

Document	Literature Number
BUF08500 Product Data Sheet	SBOS544
SM-USB-DIG Platform User Guide	SBOU098

2 BUF08500EVM Hardware Setup

Figure 2 shows the overall system setup for the BUF08500EVM. The PC runs software that communicates with the SM-USB-DIG platform. The SM-USB-DIG platform generates the digital signals used to communicate with the BUF08500 test board. Connectors on the BUF08500EVM test board allow the user to provide power to the BUF08500 and measure its output.

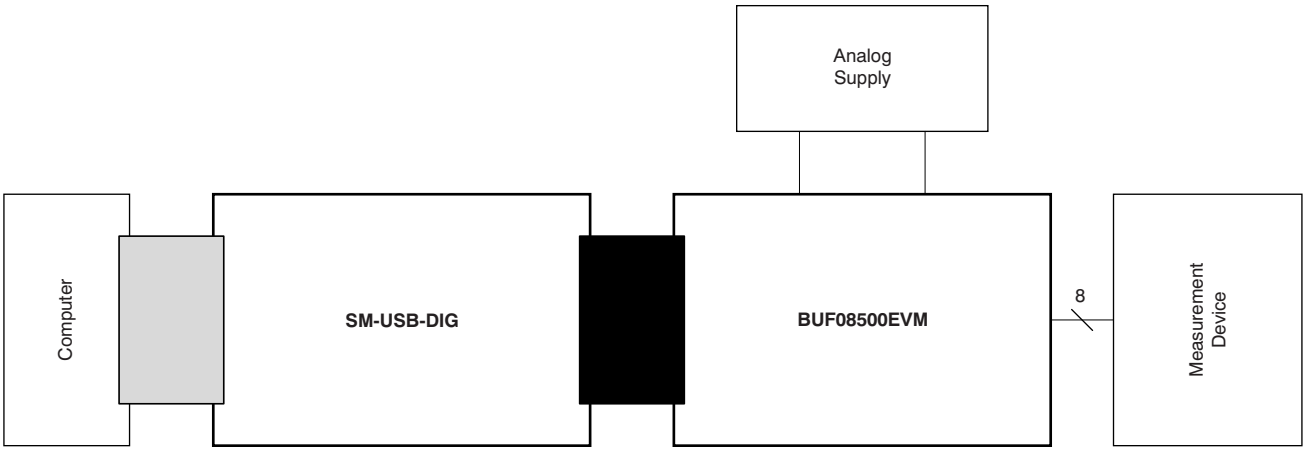


Figure 2. BUF08500EVM Hardware Setup

2.1 Theory of Operation for BUF08500 Hardware

A block diagram of the BUF08500 test board hardware setup is shown in Figure 3. The functionality of the PCB is such that it provides connections to the I²C™ interface and digital power supply lines on the SM-USB-DIG platform board. It also provides connection points for external connections of the digital voltage, supply voltages, and ground.

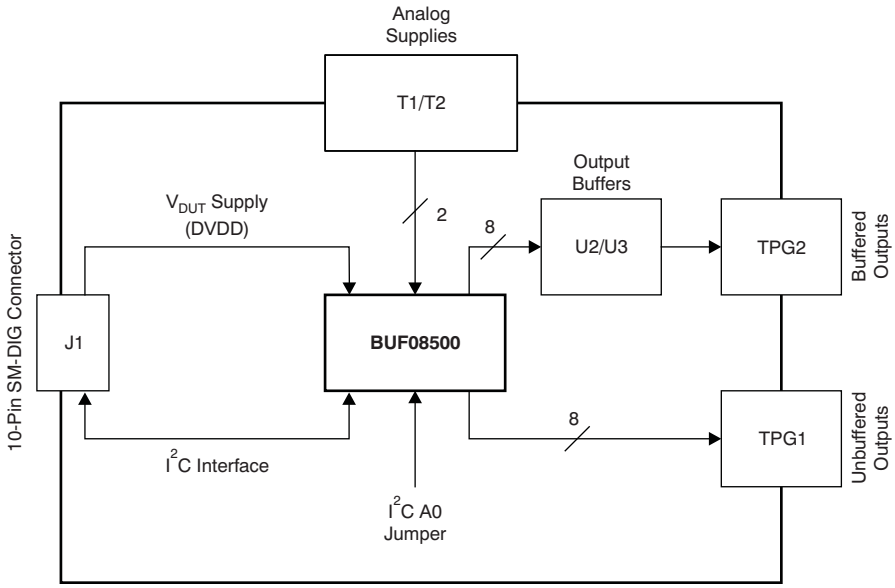


Figure 3. BUF08500EVM Board Block Diagram

2.2 Signal Definitions of H1 (10-Pin Male Connector Socket)

Table 3 lists the pinout for the 10-pin connector socket used to communicate between the BUF08500EVM and the SM-USB-DIG. It should be noted that the BUF08500EVM only uses the necessary I²C communication lines (pins 1 and 3) and the V_{DUT} and GND pins (pin 6 and pin 8, respectively) to issue commands to the BUF08500.

Table 3. Signal Definition of H1 on BUF08500EVM Board

Pin on U1	Signal	Description
1	I2C_SCL	I²C Clock Signal (SCL)
2	CTRL/MEAS4	GPIO: Control Output or Measure Input
3	I2C_SDA1	I²C Data Signal (SDA)
4	CTRL/MEAS5	GPIO: Control Output or Measure Input
5	SPI_DOUT1	SPI Data Output (MOSI)
6	V_{DUT}	Switchable DUT Power Supply: +3.3 V, +5 V, Hi-Z (Disconnected)(1)
7	SPI_CLK	SPI Clock Signal (SCLK)
8	GND	Power Return (GND)
9	SPI_CS1	SPI Chip Select Signal ($\overline{CS}$)
10	SPI_DIN1	SPI Data Input (MISO)

(1) When V_{DUT} is Hi-Z, all digital I/O are Hi-Z as well.

2.2.1 Theory of Operation for SM-USB-DIG Platform

Figure 4 shows the block diagram for the SM-USB-DIG platform. This platform is a general-purpose data acquisition system that is used on several different Texas Instruments evaluation modules. The details of its operation are included in a separate document, SBOU098 (available for download at www.ti.com). The block diagram shown in Figure 4 gives a brief overview of the platform. The primary control device on the SM-USB-DIG platform is the TUSB3210.

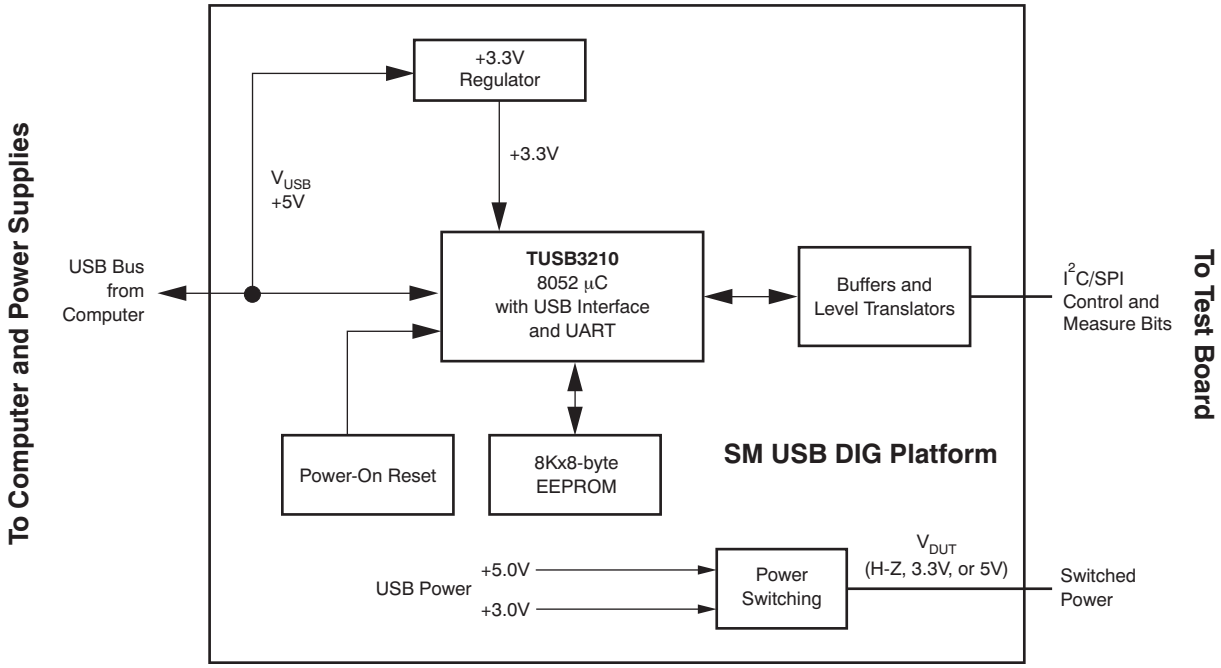


Figure 4. SM-USB-DIG Platform Block Diagram

3 BUF08500EVM Hardware

The BUF08500EVM hardware overview involves connecting the two PCBs of the EVM together, connecting the USB cable, applying power, and setting the jumpers. This section presents the details of this procedure.

3.1 Electrostatic Discharge Warning

CAUTION

Many of the components on the BUF08500EVM are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

3.2 Typical Hardware Connections

To set up the BUF08500EVM hardware, first connect the two PCBs of the EVM together (that is, the BUF08500 test board and SM-USB-DIG platform board). Next, use the included USB extension cable to connect the SM-USB-DIG to an available USB port on a PC, and then connect a power supply to T1 (and T2/T3 if necessary). The gamma voltage of each output channel can be measured at TPG1 and TPG2 with a multimeter or connected to a real-world system such as an LCD source driver. Figure 5 illustrates the typical hardware connections.

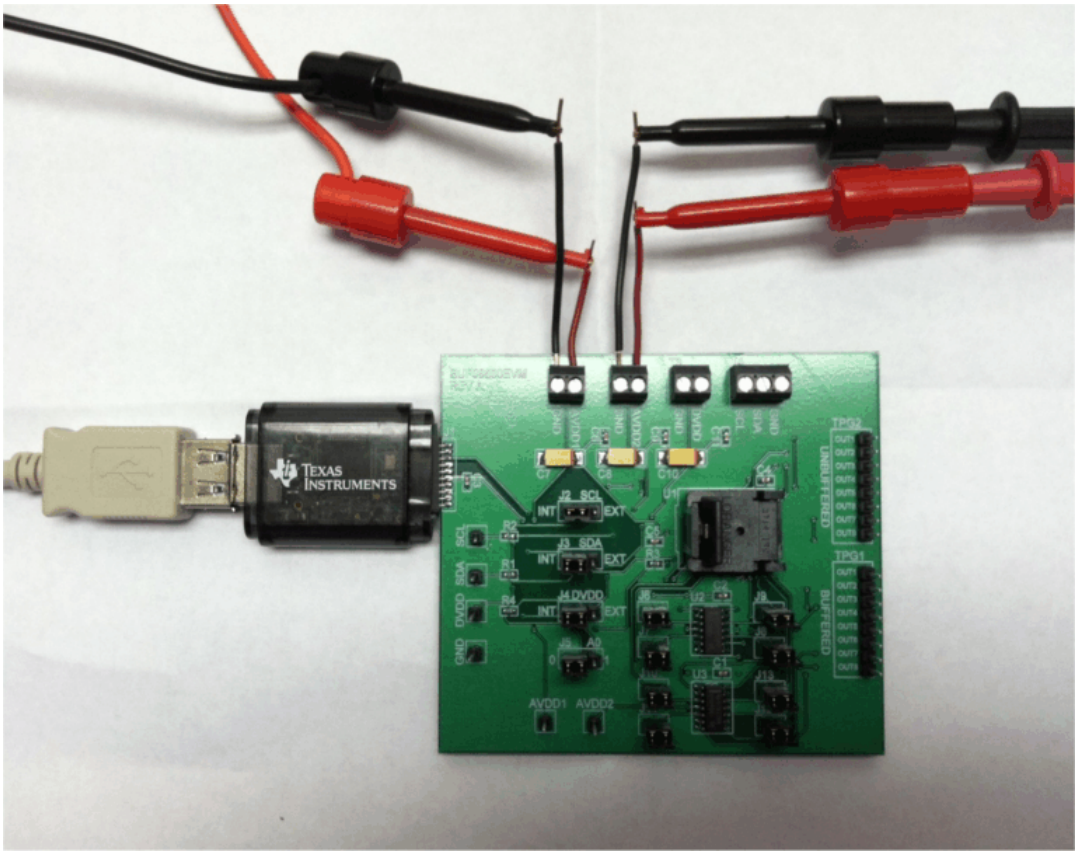


Figure 5. Typical Hardware Connections for BUF08500EVM

3.3 Connecting the Hardware

To connect the BUF08500 test board and the SM-USB-DIG platform board together, gently slide the male and female ends of the 10-pin connectors together (as shown in Figure 5). Make sure that the two connectors are completely pushed together; loose connections may cause intermittent operation.

3.4 Connecting Power

After the BUF08500EVM and the SM-USB-DIG are conjoined, connect the required power supply/supplies to the BUF08500EVM. The BUF08500EVM requires only one power supply at T1 when measuring unbuffered output voltages, but if the optional OPA4140 output buffers are connected then an additional power supply at T2 is required. Because of the common-mode input range of the OPA4140, the power supply voltage at T2 must be 4 V greater than the power-supply voltage at T1. Refer to Table 4 for more information about the power-supply requirements of the BUF08500EVM.

Table 4. BUF08500EVM Power-Supply Requirements

Connector	Label	Voltage (min)	Voltage (max)	Description
T1	AVDD1	6.5 V	20 V	BUF08500 analog supply
T2	AVDD2	$AVDD1_{MIN}$ + 4 V	$AVDD1_{MAX}$ + 4 V	OPA4140 analog supply (optional)
T3	DVDD	2.0 V	5.5 V	BUF08500 digital supply (required when J4 is set to EXT)

3.5 Connecting the USB Cable to the SM-USB-DIG Platform

Once the BUF08500EVM and SM-USB-DIG are connected to a PC as shown in Figure 6, the computer typically responds with a *Found New Hardware, USB Device* pop-up dialog. The pop-up window typically changes to *Found New Hardware, USB Human Interface Device*. This pop-up indicates that the device is ready to be used. The SM-USB-DIG uses the human interface device drivers that are part of the Microsoft® Windows® operating system.

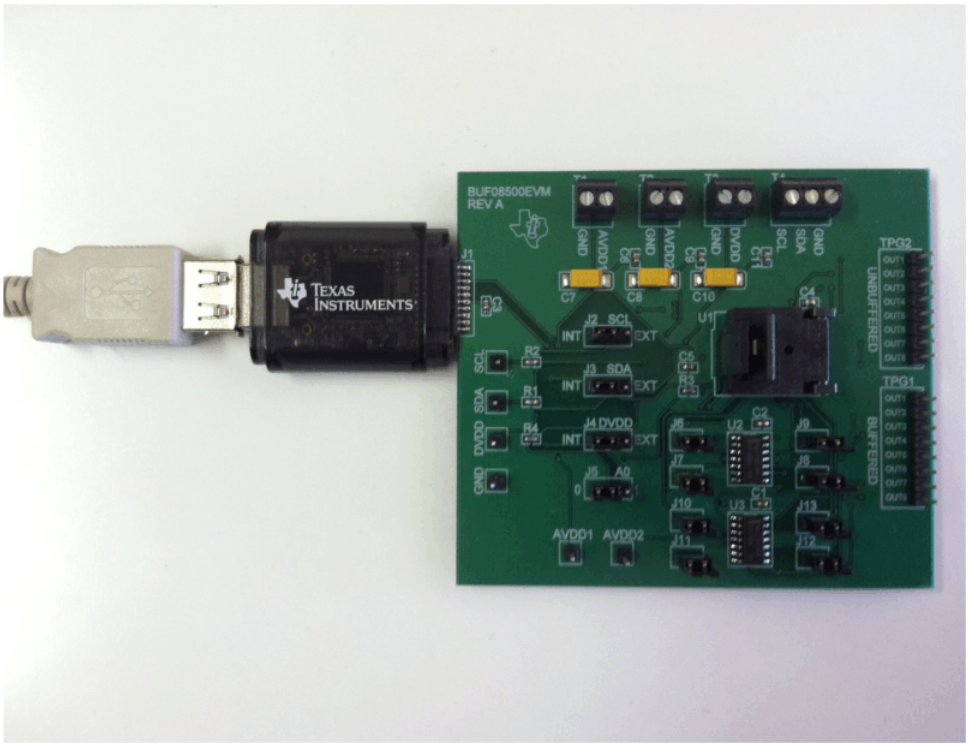


Figure 6. Connecting the USB Cable to the SM-USB-DIG Platform

In some cases, the Windows *Add Hardware Wizard* may pop up. If this prompt appears, allow the system device manager to install the human interface drivers by clicking **Yes** when requested to install drivers. Windows will confirm installation of the drivers with the message shown in Figure 7.

Figure 7. Confirmation of SM-USB-DIG Platform Driver Installation

3.6 BUF08500EVM Default Jumper Settings

Figure 8 shows the default jumper settings for the BUF08500EVM. These settings configure the system such that the digital power supply and I²C communication signals are provided internally by the SM-USB-DIG, the A0 pin is set to '0', and the OPA4140 output buffers are connected.

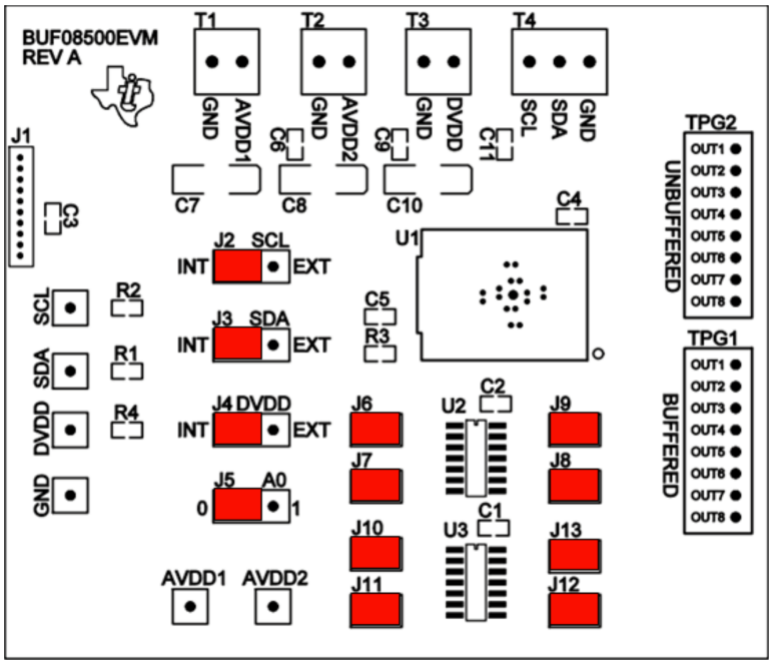


Figure 8. BUF08500EVM Default Jumper Settings

Table 5 summarizes the functions of the BUF08500EVM test board jumpers.

Table 5. BUF08500EVM Test Board Jumper Functions

Jumper	Default	Purpose
J2	INT	This jumper selects whether SCL is provided internally by the SM-USB-DIG or externally at T4.
J3	INT	This jumper selects whether SDA is provided internally by the SM-USB-DIG or externally at T4.
J4	INT	This jumper selects whether DVDD is provided internally by the SM-USB-DIG or externally at T3.
J5	0	This jumper selects whether the A0 (I²C address) pin is connected to logic 0 or logic 1.
J6-J12	Installed	These jumpers select whether to connect or disconnect the optional OPA4140 output buffers from the BUF08500 output circuit. Installing the jumpers will connect the OPA4140s, while removing the jumpers will disconnect them.

3.7 BUF08500EVM Features

This section describes some of the hardware features present on the BUF08500EVM test board.

3.7.1 J2: I²C SCL Control Setting

Jumper J2 selects where the BUF08500 I²C SCL pin is connected. If J2 is set to the INT position, the I²C clock signal is provided by the I2C_SCL pin of the SM-USB-DIG platform. When J2 is set to the EXT position, an external source connected to the SCL pin of terminal T4 must be used to provide the SCL signal to the BUF08500.

3.7.2 J3: I²C SDA Control Setting

Jumper J3 selects where the BUF08500 I²C SDA pin is connected. If J3 is set to the INT position, the I²C data signal is provided by the I2C_SDA1 pin of the SM-USB-DIG platform. When J3 is set to the EXT position, an external source connected to the SDA pin of terminal T4 must be used to provide the SDA signal to the BUF08500.

3.7.3 J4: DVDD Control Setting

Jumper J4 selects where the BUF08500 digital power supply pin is connected. If J4 is set to the INT position, the digital power supply is provided by the switchable V_{DUT} signal generated by the SM-USB-DIG platform. This voltage can be set to either 3.3 V or 5 V in the BUF08500EVM software. When J4 is set to the INT position, the **DVDD Power** button on the BUF08500EVM software controls whether the V_{DUT} supply voltage is turned on or off. When J4 is set to the EXT position, an external supply connected to terminal T3 must be used to provide the digital supply voltage to the BUF08500.

3.7.4 J5: I²C Address Hardware Setting

Jumper J5 is used to set the A0 I²C address pin on the BUF08500. Using J5, the A0 address can be set to either a logic '0' or a logic '1' to allow for two unique I²C addresses. See Section 5.2.1 for more information on how to configure the BUF08500EVM software to match the J5 hardware setting.

3.7.5 BUF08500 Device Placement: U1

The U1 location on the BUF08500EVM is a 16-pin QFN test socket that allows the user to quickly evaluate and program multiple BUF08500 devices. One drawback to this socket is that no connection is made between the PowerPAD™ of the BUF08500 and the GND plane of the BUF08500EVM test board. While in this socket, the BUF08500 cannot operate at its full output current capability as a result of thermal dissipation limitations.

3.7.6 Terminal Strips TPG1 and TPG2

Terminal strips TPG1 and TPG2 allow the user to measure the output voltage of each BUF08500 gamma channel. TPG1 connects to the outputs of the optional OPA4140 buffers, while TGP2 connects directly to the output pins of the BUF08500. The terminal strips consist of a single row of headers as shown in Figure 9. This footprint provides the user with multiple options on how to interface the output signals of the BUF08500 with the display panel that is under evaluation. The user can also develop a custom cable to connect the headers directly to a display panel.

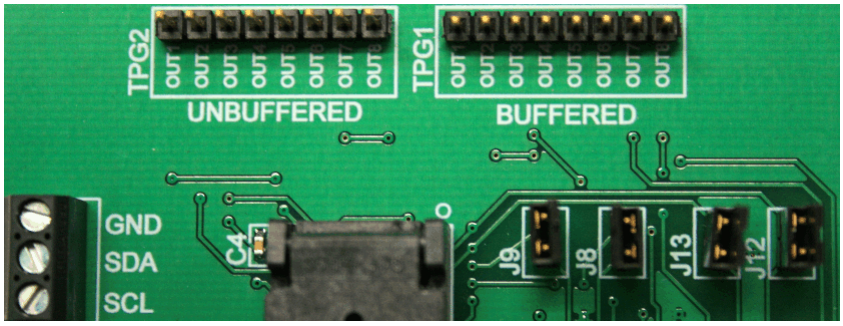


Figure 9. Buffered and Unbuffered Outputs

3.7.7 Buffered Outputs: OPA4140 (U2/U3) and J6-J12

The 250-kΩ output impedance of the BUF08500 gamma channels causes most multimeters to report a voltage that is lower than expected (usually by a few tens of millivolts). Because of this effect, two OPA4140 amplifiers in a unity-gain configuration are included on the BUF08500EVM as an optional high-output-impedance buffering stage. If the buffer stage is not desired, jumpers J6-J12 may be removed to disconnect the BUF08500 from the OPA4140s. If jumpers J6-J12 are installed but no power is provided to the OPA4140s (AVDD2 at terminal T2), the BUF08500EVM does not function properly.

4 BUF08500EVM Software

4.1 Hardware Requirements

The BUF08500EVM software has been tested on Microsoft® Windows® XP operating systems (OS) with United States and European regional settings. The software should also function on other Windows OS platforms.

4.2 Software Installation

The BUF08500EVM software is included on the CD that is shipped with the EVM kit. It is also available through the BUF08500EVM product folder on the TI website. To install the software to a computer, insert the disc into an available CD-ROM drive. Navigate to the drive contents and open the BUF08500EVM software folder. Locate the compressed file (*BUF08500EVM.zip*) and open it using WinZIP® or a similar file compression program; extract the BUF08500EVM files into a specific BUF08500EVM folder (for example, *C:\BUF08500EVM*) on your hard drive.

Once the files are extracted, navigate to the BUF08500EVM folder you created on the hard drive. Locate the *setup.exe* file and execute it to start the installation. The BUF08500 software installer file then begins the installation process as shown in Figure 10.

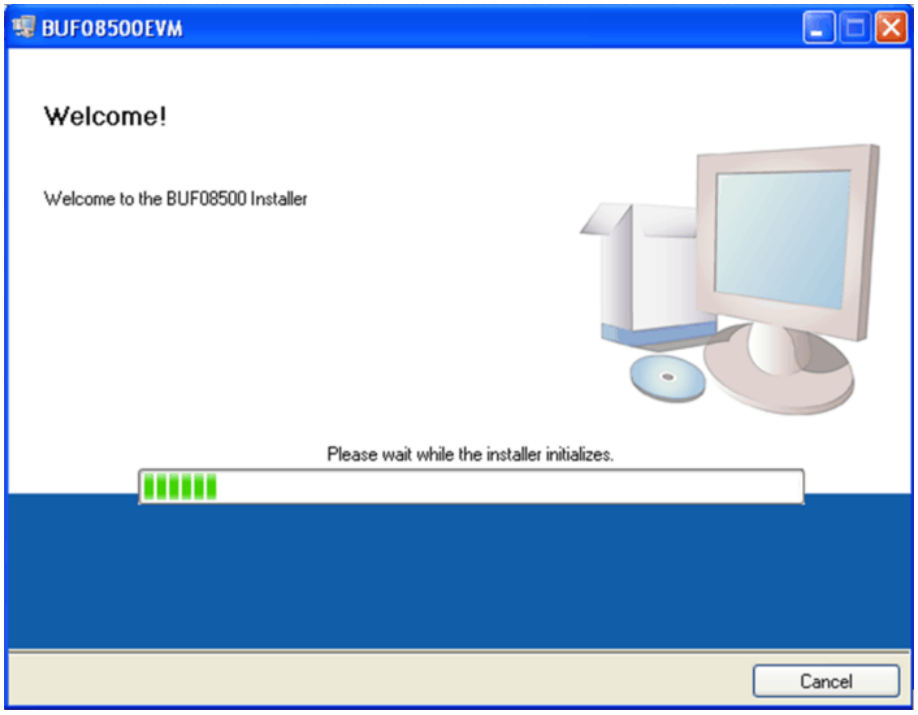


Figure 10. BUF08500EVM Software Installation

After the installation process initializes, the user is given the choice of selecting the directory in which to install the program; the default location is *C:\Program Files\BUF08500* and *C:\Program Files\National Instruments*. Following this option, two license agreements are presented that must be accepted, as shown in Figure 11. After accepting the Texas Instruments and National Instruments license agreements, the progress bar opens and shows the installation of the software, as Figure 12 illustrates. Once the installation process is completed, click **Finish**.

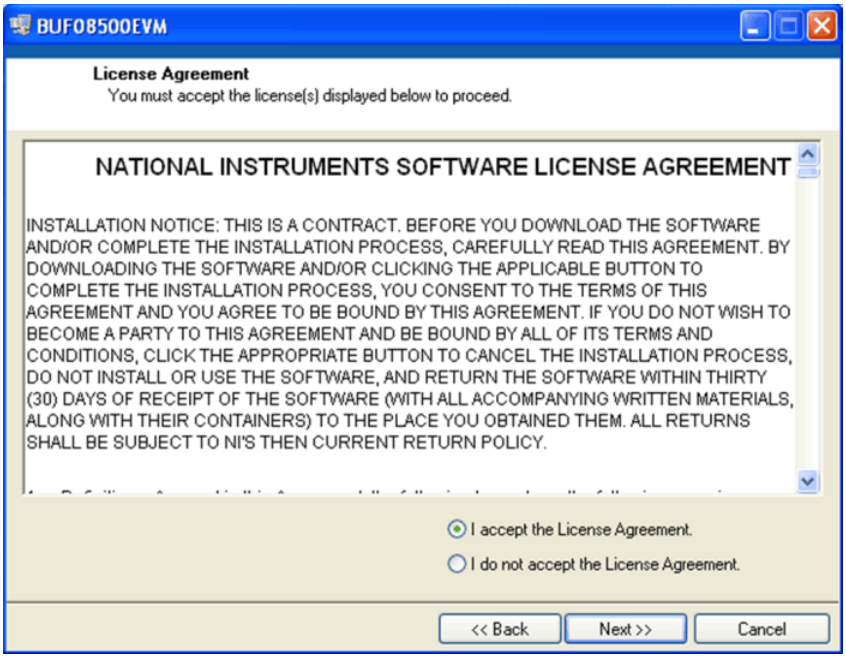


Figure 11. BUF08500EVM License Agreements

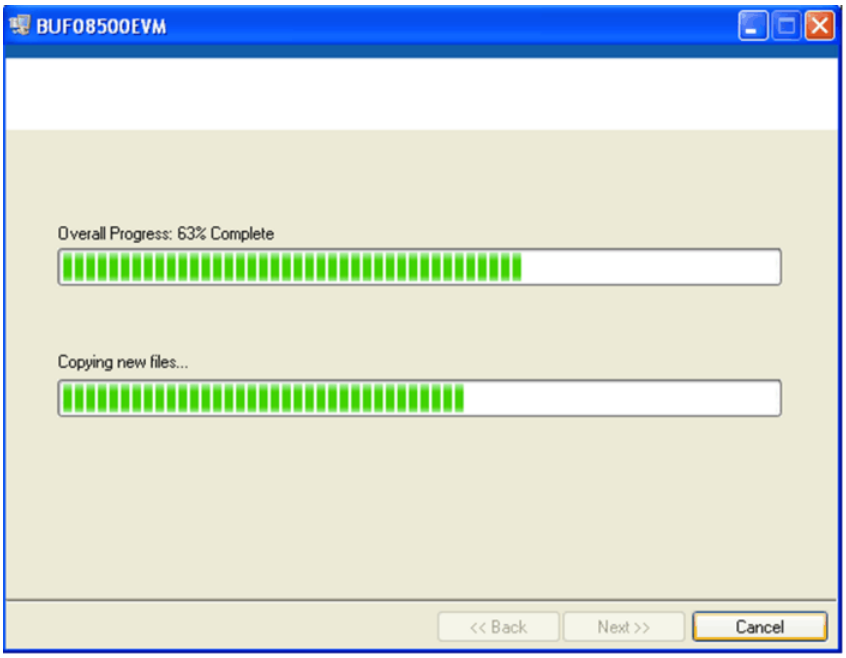


Figure 12. BUF08500EVM Software Installation Progress

4.3 Software Description and Set-Up

The BUF08500EVM software allows the user to read and write to all BUF08500 registers, program the BUF08500 non-volatile memory, and select between I^2C addresses. The software also enables the user to save, load, and cycle between register configurations. Press the **About** button, as shown in Figure 13, to verify that you have the latest version of the software.

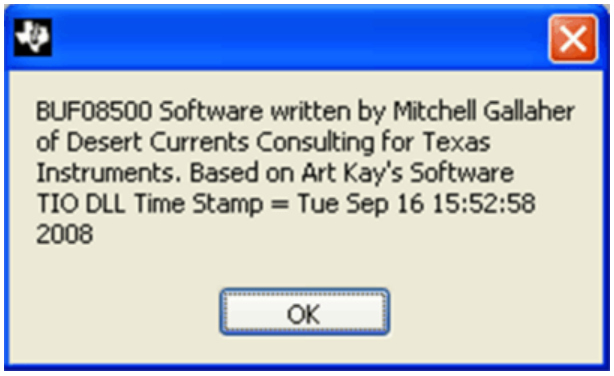


Figure 13. BUF08500EVM Software *About* **Button**

5 BUF08500EVM Software Overview

This section discusses how to use the BUF08500EVM software.

5.1 Starting the BUF08500EVM Software

The BUF08500 software can be operated through the Windows *Start* menu. From Start, select *All Programs*; then select the *BUF08500EVM* program.

Figure 14 illustrates how the software should appear if the BUF08500EVM is functioning properly.

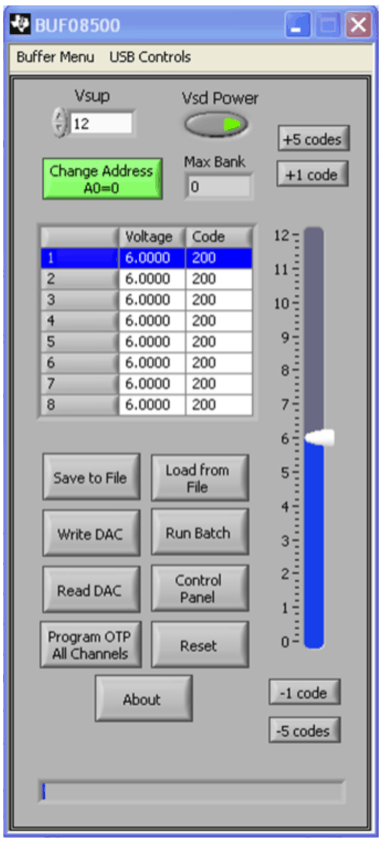


Figure 14. BUF08500EVM Software Interface

Figure 15 shows an error message that is displayed if the PC cannot communicate with the SM-USB-DIG platform. If you receive this error message, first check to see that the USB extension cable is properly connected to both the PC USB port and to the SM-USB-DIG platform. Another possible source for this error is a problem with the PC USB Human Interface Device driver. Make sure that the device is recognized when the USB cable is plugged in; recognition is indicated by a Windows-generated confirmation sound.

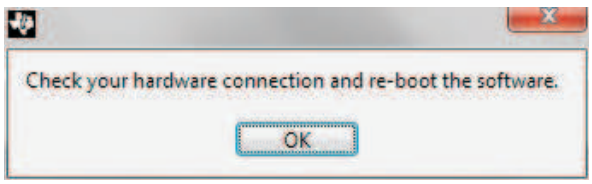


Figure 15. BUF08500EVM Software: Communication Error with the SM-USB-DIG Platform

5.2 Using the BUF08500Software

5.2.1 I²C Address Selection

As mentioned previously in the *BUF08500EVM Features* section (see Section 3.7), jumper J5 is used to set A0, the I²C address pin of the BUF08500. The user must ensure that the address selected in the BUF08500EVM software matches the setting of jumper J5. Figure 16 illustrates the proper configuration for setting A0 low (logic '0').

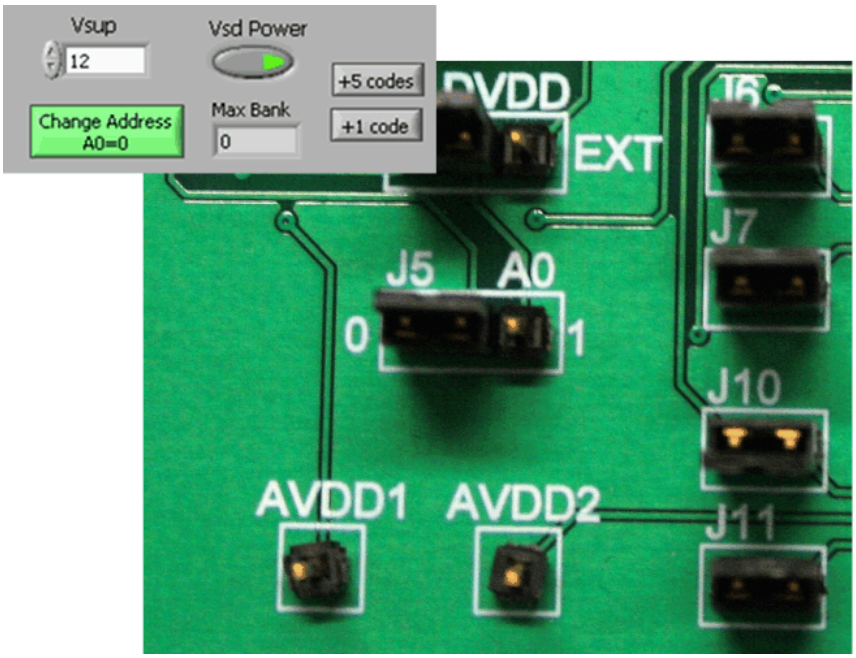


Figure 16. Hardware/Software Settings for A0 = '0'

Similarly, Figure 17 illustrates the proper configuration for setting A0 high (logic '1').

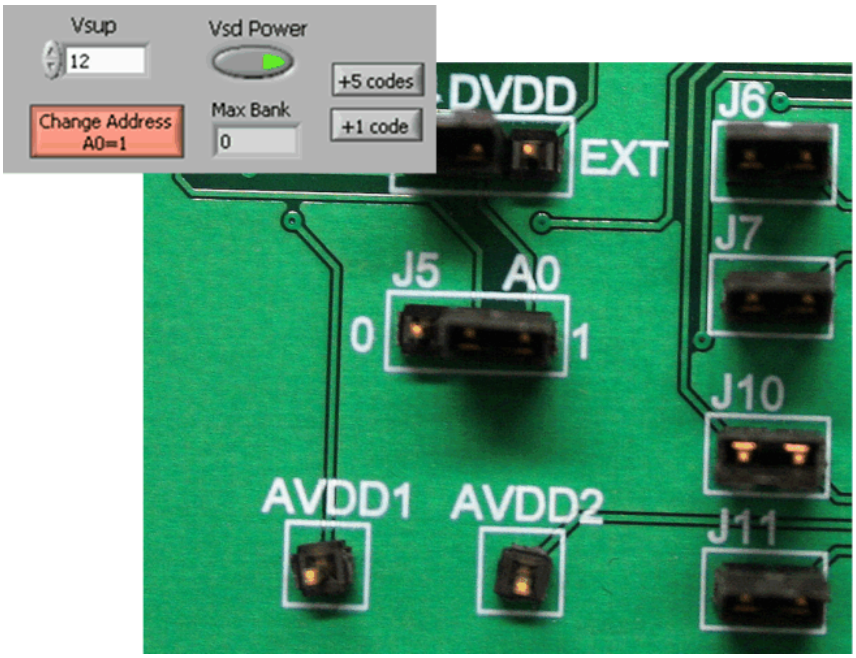


Figure 17. Hardware/Software Settings for A0 = '1'

5.2.2 Measuring the Power Supply

The user must measure the BUF08500 power supply (AVDD1) with respect to the GND on the BUF08500EVM test board and enter it in the V_{SUP} field located in the top section of the software interface, as shown in Figure 18.

Figure 18. Measuring and Entering Power-Supply Voltage

Correctly measuring and entering this supply voltage is critical to the functionality and accuracy of the BUF08500EVM, since the analog output of each channel is dependent on this voltage. The calculation is performed according to Equation 1.

$$V_{OUT} = V_{SUP} \bullet \left| \frac{Code}{1024} \right| \quad (1)$$

Example:

Write a decimal code of 1020 to the Channel 6 register. With V_{SUP} connected to 12 V, the output of Channel 6 becomes 11.953 V.

$$V_{OUT} = 12\ V \bullet \left| \frac{1020}{1024} \right| = 11.953$$

5.2.3 Read DAC Button

When the user presses the **Read DAC** button in the BUF08500EVM software, all of the BUF08500 DAC registers are read and the contents of each are stored within the software. Once the read procedure is complete, the register table is updated to show the newly-read values.

5.2.4 Write DAC Button

The BUF08500EVM software includes two modes of performing write operations to the BUF08500 registers: *Auto Write* mode and standard or *Manual Write* mode. Switching between the two modes is achieved by clicking on the Auto Write menu item found within the Buffer Menu. Figure 19 shows Auto Write mode enabled within the BUF08500EVM software.

When Auto Write mode is enabled, any changes the user makes to the output voltage settings or register values within the BUF08500EVM software are automatically written to the device.

When Auto Write mode is disabled (Manual Write mode), changes made to the output voltage settings or register values within the BUF08500EVM software are not automatically written. Instead, the user must press the **Write DAC** button to perform the write to the BUF08500. This function allows the values of multiple channels to be changed at the same time, which may be desired for some applications.

Figure 19. Auto Write Feature Enabled

5.2.5 Reset Button

Pressing the **Reset** button in the BUF08500EVM software initiates a general-call reset for the BUF08500. The status of the DAC registers after this general-call reset has been called depends upon the state of the BUF08500 internal non-volatile memory. If the non-volatile memory has been programmed, the channel registers are loaded with the most recently programmed values. If the non-volatile memory has not been programmed, the channel registers default to mid-scale (512 decimal/200 hex). Once this operation has completed, the BUF08500EVM software reads the values of each register and updates the contents of the register table.

5.2.6 Save to File Button

The register configurations of the BUF08500 DACs are displayed in both analog voltage and hexadecimal code formats. The register configurations can be saved to a text file by using the **Save to File** button.

Pressing the **Save to File** button opens a dialog box as shown in Figure 20. TI's recommended best practice for working with saved files is to create a directory exclusively for BUF08500 register files. Enter a unique file name in the *File name* field for the current BUF08500 configuration. Press the **OK** button to save the file.

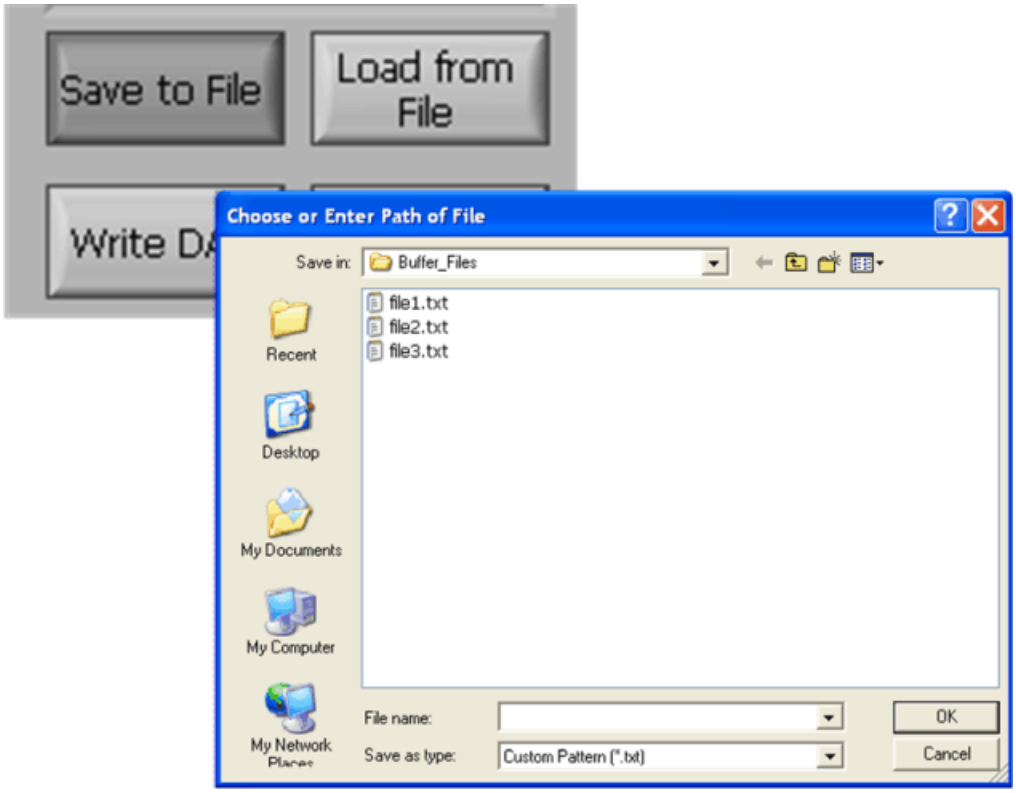


Figure 20. Save to File Dialog Box Button and Window

BUF08500 configuration files are saved as a text file that can be opened in a text editor, as Figure 21 illustrates.

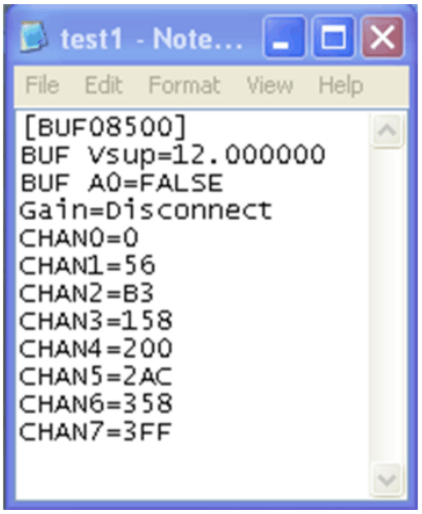


Figure 21. File Format of Saved Data

5.2.7 Load From File Button

The BUF08500EVM software is also able to load configuration files saved from previous evaluations. A saved file can be loaded into the BUF08500 using the **Load From File** button as shown in Figure 22. The program remembers the location of the most recent saved file. Simply select the desired file and press *Open*.

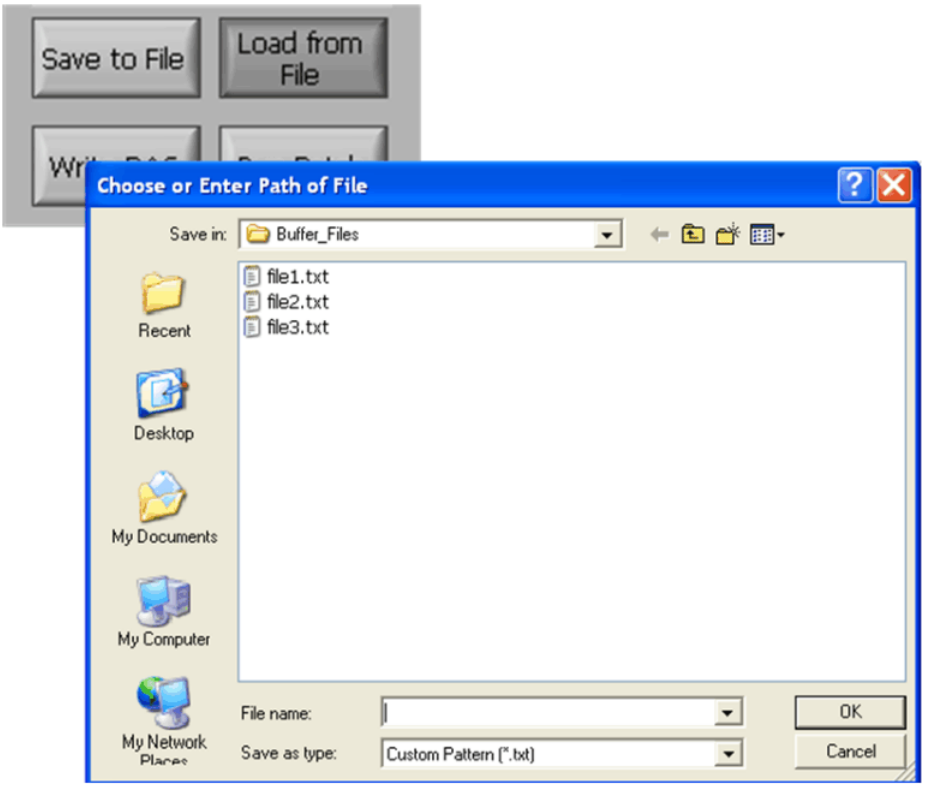


Figure 22. Load From File Button and Window

5.2.8 Changing the DAC Analog Voltage

The voltage of any of the DAC channels can be adjusted in several ways. First, you can change the voltage by entering the desired voltage directly in the voltage text box. In order to be able to manually type the voltage into the text box, you must first click on the cell to be edited. Click a second time and the cell turns from blue to black, which allows the user to type the updated voltage in the cell. The hexadecimal DAC codes can be entered in the *Code* column in the same manner.

Another method of changing the voltage of a DAC channel is through the use of the slider on the main software window. There is only a single slider that is used for all channels. In order to use the slider to adjust the voltage of a particular channel, that channel must first be selected. To select a channel, click on either the channel number, voltage, or code of a particular channel. The entire channel row highlights in blue to show the user that the channel is selected. Adjusting the slider bar then only updates the highlighted channel.

The final method to change DAC voltages is through the **±1 Code** and **±5 Code** buttons on the main software window. These buttons allow for fine and coarse adjustments, respectively, to the highlighted channel, giving the user the ability to quickly step the channel output up or down as needed without having to manually enter the changes in the *Code* column.

5.2.9 Run Batch Button

The **Run Batch** button (as shown in Figure 23) enables the user to configure the BUF08500 to cycle through different register configurations in a continuous loop. When connected to the end application, this feature can be used to cycle through different gamma settings to determine the optimal settings for a given application.

When the **Run Batch** button is pressed, a new dialog box displays as Figure 23 shows. The delay time is the amount of time allowed between loading new configurations into the BUF08500.

Use the **Single Step Up** and **Single Step Down** buttons to step through the selected files manually. The currently selected file name is displayed in the lower left corner area of the dialog box. Double-click on the file names to select them. Once a series of filenames have been selected, the check box turns dark. Double-click on a filename again to unselect it from the batch.

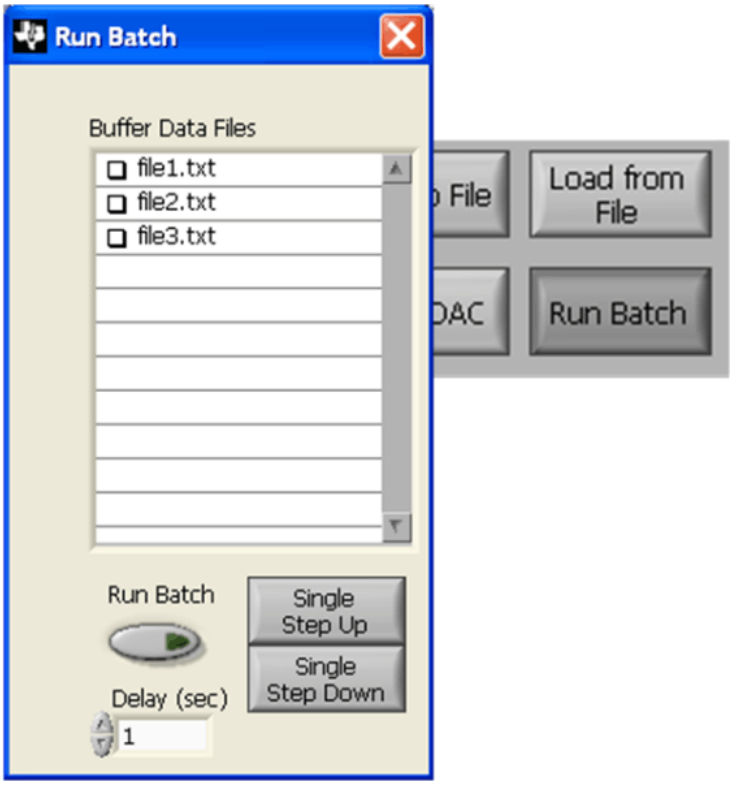


Figure 23. Run Batch Dialog Button and Window

5.2.10 Control Panel Button

Pressing the **Control Panel** button brings up a display panel that allows you to adjust each channel using a set of graphical sliders, as shown in Figure 24. Simply drag the slider to adjust the desired channel output. The DAC code and corresponding output value of each channel change automatically. This function is similar to the slider present on the primary BUF08500EVM software window that changes based on the channel that highlighted (as discussed in the above section).

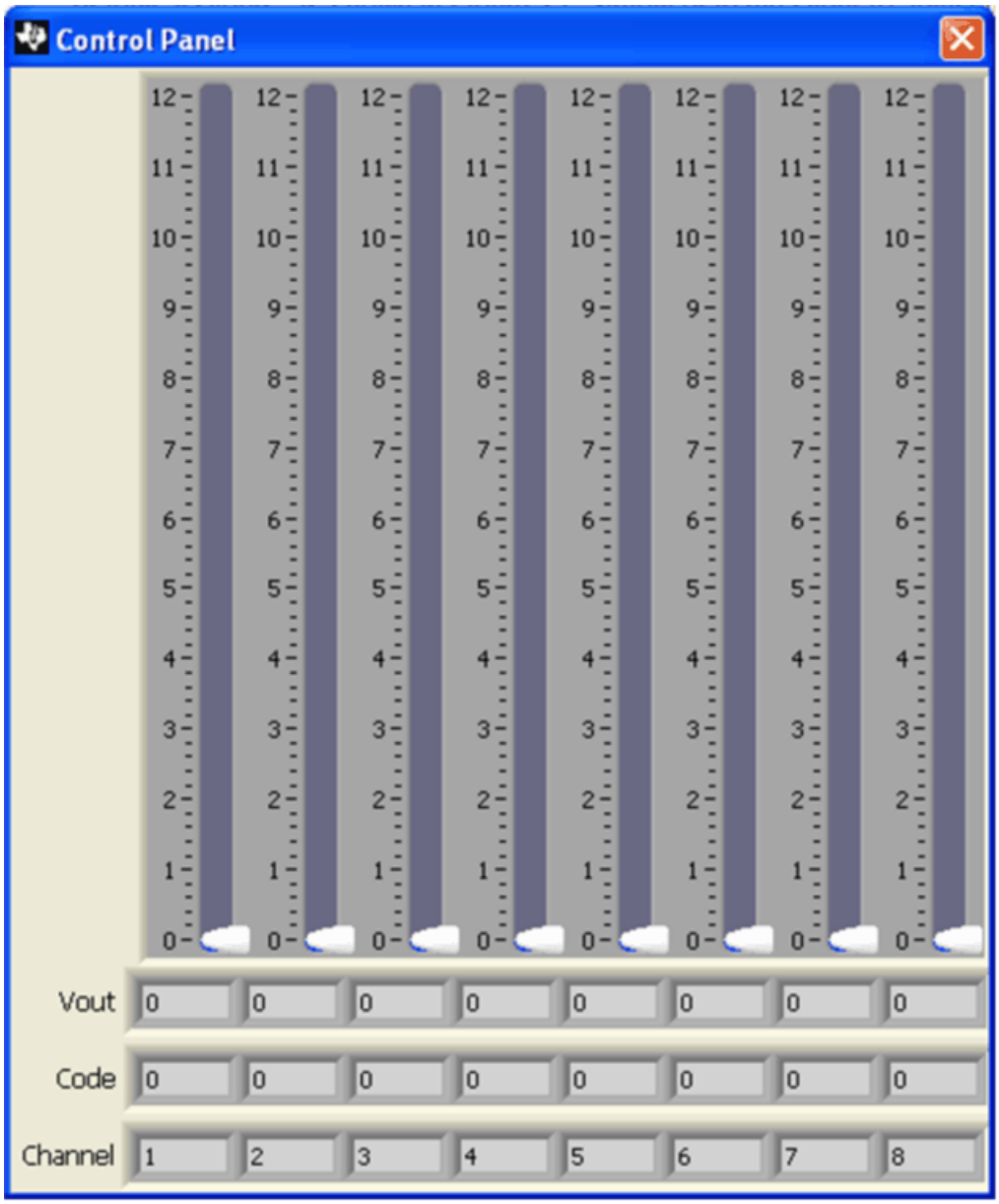


Figure 24. Control Panel Button and Window

5.2.11 Program OTP All Channels Button

Pressing the **Program OTP All Channels** button allows the user to program the current gamma settings into the BUF08500's non-volatile memory. All eight channels are programmed simultaneously. The values are stored in the memory bank that is selected via the BKSEL switch.

6 Hardware and Schematic

This section contains the complete bill of materials and PCB layout for the BUF08500EVM. The BUF08500EVM schematic is appended to this user guide.

NOTE: The board layout is not to scale. This image is intended to show how the board is laid out; it is not intended to be used for manufacturing BUF08500EVM PCBs.

6.1 PCB Layout

Figure 25 shows the PCB layout of the BUF08500EVM.

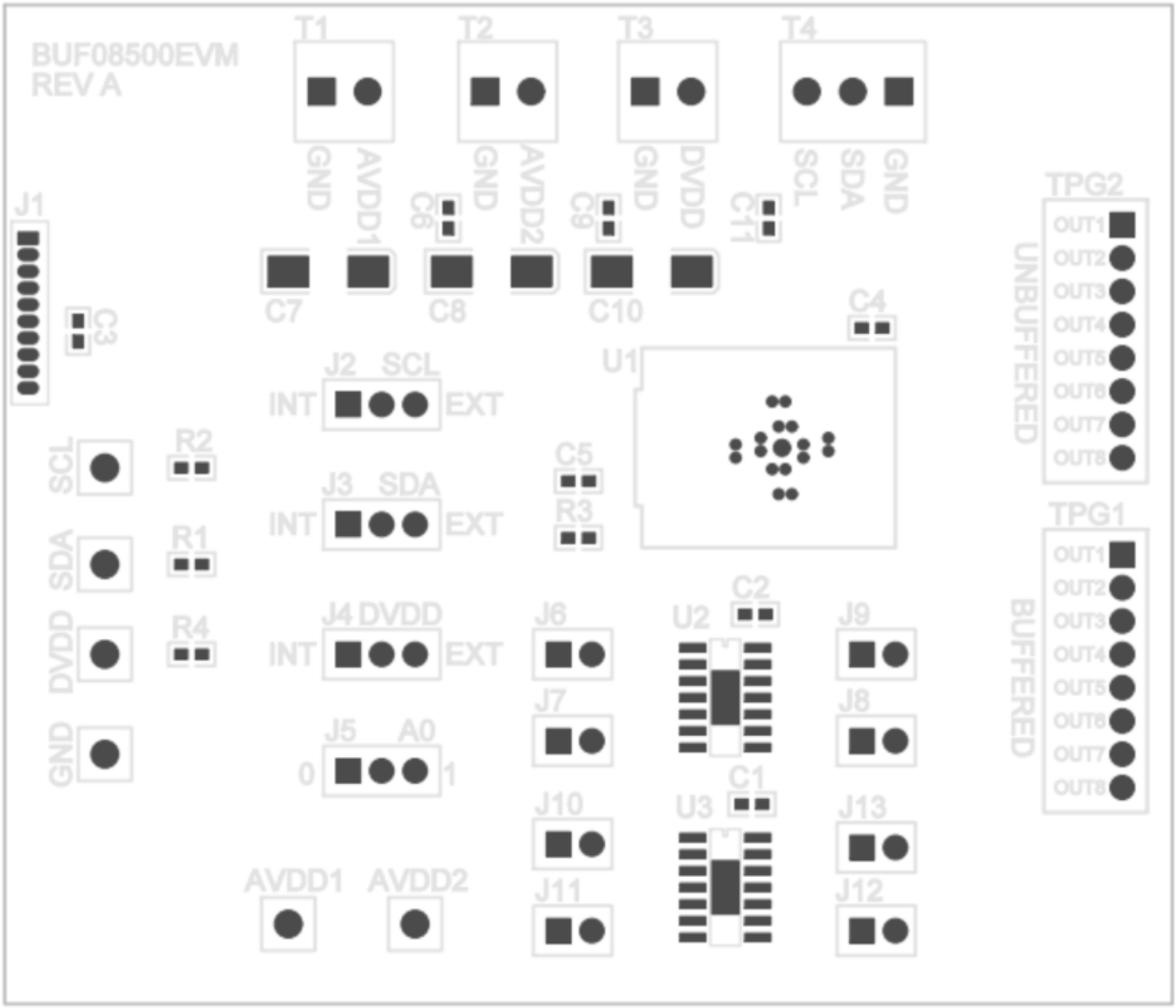


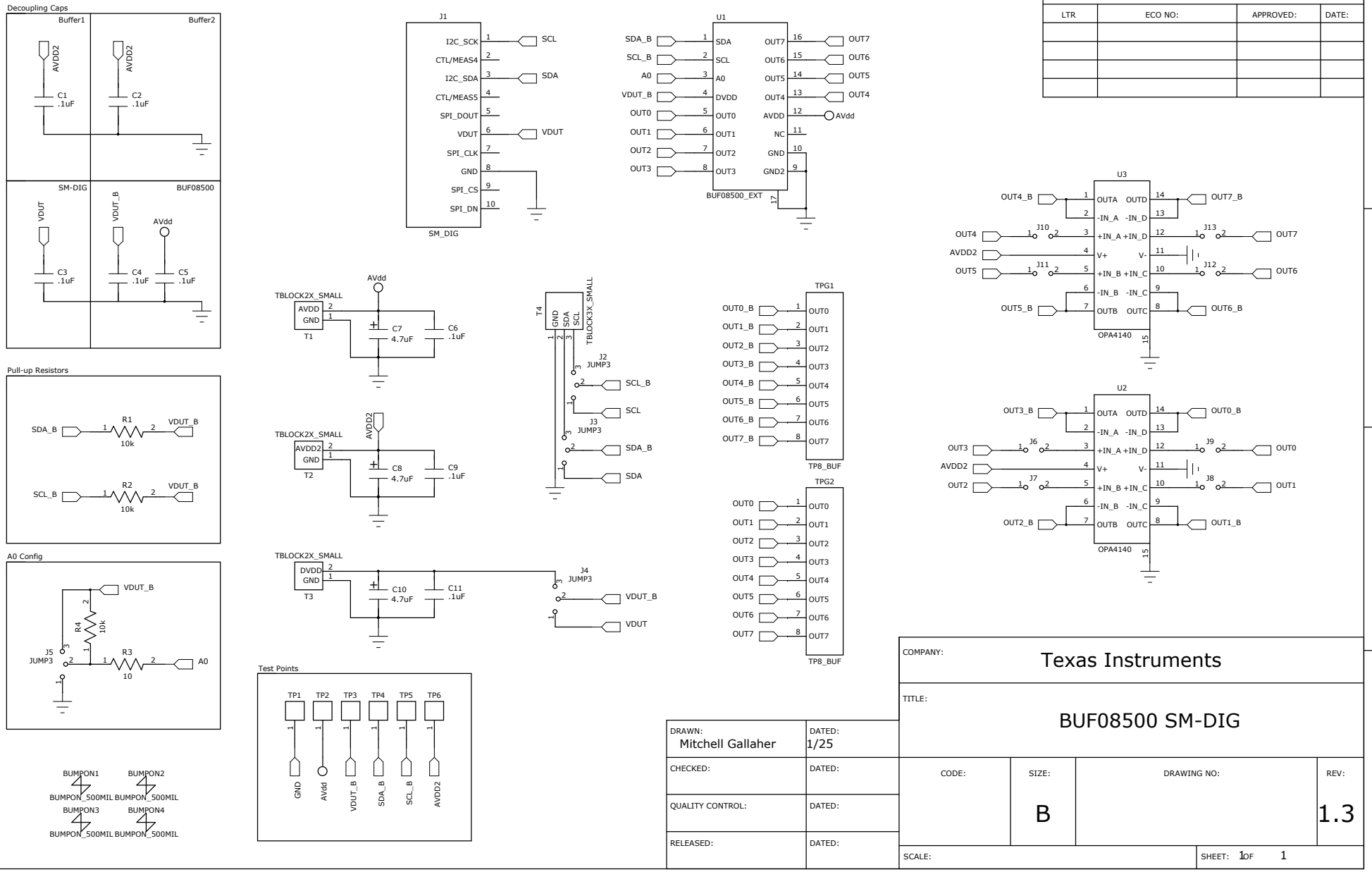
Figure 25. BUF08500EVM PCB Top Layer (Component Side)

6.2 Bill of Materials

Table 6 lists the bill of materials for the BUF08500EVM.

Table 6. Bill of Materials

Item No.	Qty	Value	Ref Des	Description	Vendor/Mfr	Part Number
1	3	10 kΩ	R1, R2, R4	Resistor, 10 kΩ 1/10W 5% 0603 SMD	Stackpole Electronics	RMCF0603JT10K0
2	1	10 Ω	R3	Resistor, 10 Ω 1/10W 5% 0603 SMD	Panasonic	ERJ-3GEYJ100V
3	3	4.7 µF	C7, C8, C10	Capacitor, Tantalum, 4.7 µF 35V 10% SM	AVX Corp.	TAJC475K035RNJ
4	8	0.1 µF	C1-C6, C9, C11	Capacitor, Ceramic, 0.10-µF 25-V X7R 10% 0603	TDK Corp.	C1608X7R1E104K
5	1		U1	BUF08500 connector socket	Loranger	
6	1		N/A	BUF08500	Texas Instruments	
7	2	SOIC Package	U2, U3	OPA4140, SOIC package	Texas Instruments	OPA4140AID
8	1	TP cut to size (Length is 1 pos.)	Test Points All, Jumpers All	Connector, Header 50-Position 0.100" SGL Gold	Samtec	TSW-150-07-G-S
9	12		Jumpers, All	Hunt LP w/Handle 2-Position 30AU	Tyco Electronics	881545-2
10	1		T4	3-Block Terminal 3.5mm	On Shore Technology Inc	ED555/3DS
11	3		T1,T2,T3	2-Block Terminal 3.5mm	On Shore Technology Inc	ED555/2DS
12	4		Bumpons	Bumpon Hemisphere .50X.14 Clear	3M	SJ-5312 (CLEAR)
13	1	Super Mini DIG connector Socket	J1	Connector Socket RT Ang 1-Pos .050	Mill-Max Manufacturing	851-43-050-20-001000



REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

DRAWN: Mitchell Gallaher	DATED: 1/25	COMPANY: Texas Instruments	
CHECKED:	DATED:	TITLE: BUF08500 SM-DIG	
QUALITY CONTROL:	DATED:	CODE:	SIZE: B
RELEASED:	DATED:	DRAWING NO:	REV: 1.3
		SCALE:	SHEET: 1 OF 1

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 6.5 V (min) to 20 V (max) for AVDD1 and 10.5 V (min) to 24 V (max) for AVDD2 and the output voltage range of 9 V (min) to 20 V (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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