

#### Evaluating the ADuM4177, 40 A Source/30 A Sink SiC Isolated Gate Driver with Slew-Rate Control and Built-In Self Tests

## **FEATURES**

- ▶ 40 A (source), 30 A (sink) peak drive output capability
- Output power device resistance: 0.38 Ω per MOSFET
- ► Test infrastructure for
  - ▶ SPI communication
  - Slew-rate control
  - Desaturation detection
  - Miller drive
  - Active short-circuit
  - Temperature sensing
  - ► Fault reporting
  - Multiple dummy loads

# **EVALUATION KIT CONTENTS**

EVAL-ADuM4177EBZ evaluation board

#### **EQUIPMENT NEEDED**

- ▶ Three variable power supplies up to 25 V and 1 A
- ▶ USB-SDP-CABLEZ required for SPI communication
- Signal generator
- Oscilloscope

#### **DOCUMENTS NEEDED**

► ADuM4177 data sheet

### SUPPORTED /COUPLER MODELS

▶ ADuM4177

### SOFTWARE NEEDED

ADuM4177 evaluation software

## **GENERAL DESCRIPTION**

The EVAL-ADuM4177EBZ evaluation board shows the advanced features of the ADuM4177 while maintaining flexibility in a testing environment. The EVAL-ADuM4177EBZ evaluation board layout delivers a circuit that is easy to control through jumper pins and with access to all of the pins through headers and input and output connectors. A more optimized layout is possible that increases the performance of the system.

The EVAL-ADuM4177EBZ evaluation board works with the USB-SDP-CABLEZ programming cable to access the secondary side electronically erasable programmable read-only memory (EE-PROM) and includes the option to drive the serial-peripheral interface (SPI) bus with any other SPI compatible system. The USB-SDP-CABLEZ operates with a 3.3 V logic supply, while the ADuM4177 is typically powered with 5 V. Resistor dividers are added on the SPI channels to allow interfacing.

This user guide shows how to use the ADuM4177 evaluation board to perform basic evaluations such as propagation delay testing, active short-circuit (ASC) function, and desaturation (DESAT). This user guide also shows how to use the evaluation software to access the user configurable bits and explains how to simulate EEPROM settings and program bits into nonvolatile memory.

Full specifications on the ADuM4177 are available in the ADuM4177 data sheet available from Analog Devices, Inc., and must be consulted with this user guide when using the EVAL-ADuM4177EBZ evaluation board.

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# **REVISION HISTORY**

5/2023—Revision 0: Initial Version

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## EVAL-ADUM4177EBZ EVALUATION BOARD PHOTOGRAPH

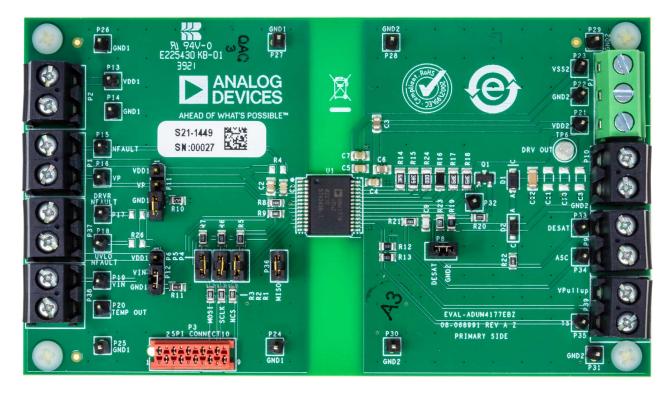


Figure 1. EVAL-ADuM4177EBZ Evaluation Board Photograph

# **EVALUATION BOARD CONFIGURATIONS**

The EVAL-ADuM4177EBZ evaluation board is preconfigured with the output resistors and a capacitive-load as follows:

- R14: V<sub>OUT ON1</sub> resistor, 3.9 Ω
- R15: V<sub>OUT ON2</sub> resistor, 3.9 Ω
- R16: V<sub>OFF</sub> SOFT resistor, 300 Ω
- R17: V<sub>OUT OFF1</sub> resistor, 3.9 Ω
- R18: V<sub>OUT OFF2</sub> resistor, 3.9 Ω
- ► C12: Load capacitor, 100 nF

Figure 2 provides the information about the ADuM4177 and its external components, which the user can use to modify the gate driver design. Figure 3 outlines the evaluation board features available for the user.

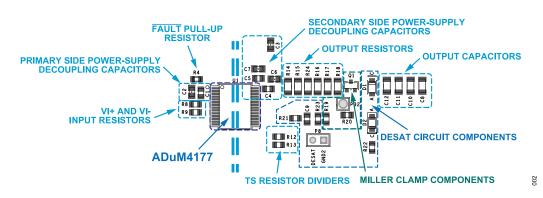


Figure 2. Outline of ADuM4177 Top Component Details

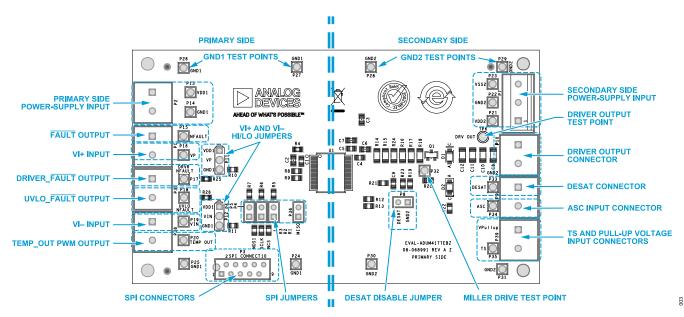


Figure 3. Outline of EVAL-ADuM4177EBZ Evaluation Board Features

# **EVALUATION BOARD CONFIGURATIONS**

# POWER CONNECTIONS

The ADuM4177 is an isolated gate driver, and there are two different isolation regions on the device. The left side of the IC (Pin 1 to Pin 14) is referred to as the primary side. The right side of the IC (Pin 15 to Pin 28) is referred to as the secondary side. The primary side is powered by the V<sub>DD1</sub> pin and the GND<sub>1</sub> pin. The primary side controls the input logic, SPI communications, and fault reporting. Voltages between 4.4 V and 7 V are recommended for the V<sub>DD1</sub> pin to the GND<sub>1</sub> pin. The secondary side voltage controls the output side of the ADuM4177. The voltage from the  $V_{DD2}$ pin to the V<sub>SS2</sub> pin controls the voltage swing seen at the driven power device. The  $V_{DD2}$  pin to  $V_{SS2}$  pin voltages are recommended to be between 15 V and 23 V. By default, the secondary side voltage must be a bipolar voltage were V<sub>SS2</sub> to GND<sub>2</sub> must be between -5 V to -3.25 V to support silicon carbide (SiC) power devices. Unipolar mode of operation is also possible where V<sub>SS2</sub> is connected to GND<sub>2</sub> that requires disabling the V<sub>SS2</sub> UVLO through SPI programming.

**Caution**: Do not supply bipolar voltage when operating in unipolar mode as it damages the ADuM4177.

# INPUT AND OUTPUT CONNECTIONS

Drive the V<sub>P</sub> pin in P1 screw terminal with any 5 V logic or 3.3 V logic, push-pull complementary metal-oxide semiconductor (CMOS) connection or with an adequate open-drain configuration if the correct pull-up resistor is used. When the V<sub>P</sub> pin is driven with a 50  $\Omega$  load capable source, a jumper in P11 from Pin 2 (V<sub>P</sub>) to Pin 3 (GND<sub>1</sub>) is recommended to connect the 50  $\Omega$  load termination. Resistor R10 is a 0603 surface-mount device (SMD) resistor that allows 50  $\Omega$  termination.

Drive the V<sub>IN</sub> pin in P38 screw terminal. When the V<sub>IN</sub> pin is driven with a 50  $\Omega$  load capable source, a jumper in P12 from Pin 2 (V<sub>IN</sub>) to Pin 3 (GND<sub>1</sub>) is recommended to connect the 50  $\Omega$  load termination resistor R11.

When the inputs V<sub>P</sub> and V<sub>IN</sub> is not driven, jumper P11 and P12 can be used to toggle from V<sub>DD1</sub> and GND<sub>1</sub> through the 50  $\Omega$  resistors.

Monitor the output in P10 screw terminal or use TP6 DRV OUT test point.

# **USING SPI**

The EVAL-ADuM4177EBZ evaluation board interfaces easily with the USB-SDP-CABLEZ cable. When using the SPI bus, place jumpers on the MOSI, MISO, NCS, and SCLK jumper pins. Connect the USB-SDP-CABLEZ to Jumper P3. The EVAL-ADuM4177EBZ evaluation board has an indexing hole to ensure proper polarity.

Test any other SPI system on the EVAL-ADuM4177EBZ evaluation board by connecting cables to the bottom side of the MOSI, MISO, NCS, and SCLK jumpers. The pins of the EVAL-ADuM4177EBZ evaluation board are labeled on the silkscreen.

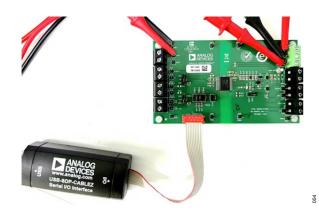


Figure 4. EVAL-ADuM4177EBZ Evaluation Board with USB-SDP-CABLEZ Connected

# DESAT OVERRIDE

The P8 jumper provides a simple method for tying the DESAT pin to the  $GND_2$  pin. This method removes the possibility of DESAT fault stopping the output drive. When testing DESAT capability of the ADuM4177, remove the default jumper on P8 then connect the collector/drain of the power switch to the DESAT pin through P9 screw terminal.

# ASC INPUT

Access ASC pin through P9 screw terminal and P34. A 10 k $\Omega$  resistor R21 connects ASC to GND<sub>2</sub> to pull down ASC to GND<sub>2</sub> level when there is no input in P9 or P34.

# **TEMPERATURE SENSE INPUT**

Without remote temperature sensing device in place, the temperature sense (TS) pin is pulled to V<sub>SS2</sub> through 1 kΩ resistor R12, which produces about 210 mV of TS voltage with respect to V<sub>SS2</sub> corresponding to high temperature operation mode. To create a middle range voltage on the TS pin, another 1 kΩ resistor is provided connected to V<sub>PULL-UP</sub> on P39 screw terminal and TS pin. Connecting V<sub>PULL-UP</sub> pin to GND<sub>2</sub> pin simulates a midrange temperature simulation on TS. To simulate a low temperature reading on the TS pin, supply V<sub>PULL-UP</sub> with a positive voltage resulting in a higher voltage in TS corresponding to a low temperature reading at the ADuM4177 remote temperature sensing pins. By default, the TS comparator of the ADuM4177 is disabled, thus, high or low temperature readings does not flag a fault.

# **EVALUATION BOARD CONFIGURATIONS**

### **EXAMPLE PROPAGATION DELAY TESTING**

Perform an example propagation delay testing from a stock configuration as shown in Figure 5. The V<sub>P</sub> pin is driven by a pulse generator with 50  $\Omega$  termination. The V<sub>DD1</sub> pin is fed with 5 V referenced to the GND<sub>1</sub> pin. The V<sub>DD2</sub> pin is fed with 18 V referenced to the GND<sub>2</sub> pin. The V<sub>SS2</sub> pin is fed with –5 V referenced to the GND<sub>2</sub> pin. For this configuration, the USB-SDP-CABLEZ is not used but it is possible to perform the test with the USB-SDP-CABLEZ connected to the ADuM4177.

Measuring P10 and/or TP6 DRV OUT test point simulates what an insulated-gate bipolar transistor (IGBT)/SiC with a 3.9  $\Omega$  series gate resistances sees at the gate.



Figure 5. Example Propagation Delay Test Setup

# **EVALUATION BOARD SOFTWARE**

# SOFTWARE INSTALLATION PROCEDURE

To use the USB-SDP-CABLEZ for SPI communication, an ADuM4177 LabVIEW<sup>®</sup> executable GUI is available. The ADuM4177 GUI requires to install USB-SDP-CABLEZ drivers and a LabVIEW run-time engine 2015 or compatible.

To install the drivers and the LabVIEW software, do the following steps:

- 1. Install SDPdrivers.exe, available within the ADuM4177 Customer Eval.zip.
- 2. Install LabVIEW Run-Time Engine 2015 SPI (32-bit) or later (available from National Instruments).
- Extract the ADuM4177 Customer Eval.zip to desired folder. Opening the ADuM4177 Customer Evaluation Rev. XX.exe runs the ADuM4177 GUI. It is recommended to have the USB-SDP-CABLEZ plugged in before opening the GUI.

# **PROGRAM BUTTON DESCRIPTIONS**

#### Run

This button allows the LabVIEW program to run. When the ADuM4177 GUI is opened, the default setting is run as shown by the black arrow.



LabVIEW PROGRAM IS RUNNING.

LabVIEW PROGRAM IS STOPPED. CLICK TO START.



### Stop

This button stops the LabVIEW program. Alternate methods of stopping the program are to close the window or to force quit the program.

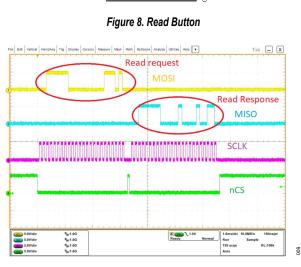


CLICK TO STOP LabVIEW PROGRAM.



### Read

**Read** buttons are available for each user accessible register. Click **Read** button to read the register inline with the **Read** button. Each time the **Read** button is clicked, the GUI actually performs two SPI transfers. The first transfer requests the read of the intended register, and the second transfer reads the result. If probing the SPI lines, each Read request results in two CS falling edges.



Read

Figure 9. Example Single Read Button Press Waveforms

#### Write

900

200

Write buttons are available for registers that are user adjustable. Click Write button to write the data in the GUI inline with the Write button. All necessary cyclic redundancy check (CRC) codes are automatically calculated and transmitted by the ADuM4177 GUI.



Figure 10. Write Button

These examples assume the setup described in the Software Installation Procedure is done.

#### **TEST COMPUTER TO CABLE CONNECTION**

The following example sequence shows how to make sure the ADuM4177 GUI is communicating with the programming cable.

- 1. Connect programming cable to computer.
- 2. Open ADuM4177 Customer Evaluation Rev. XX.exe.
- **3.** Observe initial register status.
- 4. Perform Example Read Command.

	lelp	
٠ 🖉 🥌		
ADuM417	77 Customer	r Evaluation Rev. 1.0
Write Read	IC1 Analog Status 00000000	DT Fault 🕘 TSD1 Fault 🌒
Write Read	IC1 Digital Status	Fuse Linc, Err 🔮 Fuse Corr. Err 🔮 PWM Faut 🌒 DIST Faut 1 🌑 CRC Faut 1 🕲 COM Faut 1 🔮
Read	PWM 1 Duty 0	0.0% 0.0°C
Read	PWM 2 Duty	0.0% 0.0°C
Read	K3 Revision	I contract of the second se
Write Read	C3 Analog Status	GH Err 🕐 GL Err 🔮 DESAT 🌒 TSD2 🔮 OVP VSS2 🔮 UVLO VSS2 🔮 OVP VCD2 🔮 UVLO VDD2
Write Read	IC3 Digital Status 🖉 cccccccc3	U Linc 🕘 U Carr 🌑 F Linc 🕘 F Cerr 🕥 Prog Fault 🌑 BIST Fault 🌑 CRC Fault 🕲 CON Fault 🕲
Write Read	Control 0	U Uhre 🕲 U Carr 🕐 F Uhre 🌑 F Cerr 🖤 Prog Fault 🕲 BST Fault 🌑 CRC Fault 🕲 CON Fault 🕲
Write Read	Control 0	Pogan 🕘 Servara 2 🖨 Sevara 1 🗑
Write Read	Centrel 0 GAIN1 0000000	Traper         Desart 2           Tiger         Secure 1           Tiger         Secure 1           Tiger         Secure 1
Write Read Write Read Write Read	GANH 0000000 0F75E11 0000000	There         Server 1           TS Gan         Server 1           TS Gan         Server 2           TS Gan         Server 3
Write Read	Centrel B GAR1 COCODOC DFF3ET1 COCODOC User Operating Mode COCODOC	There         Server 1           TS Gan         Server 1           TS Gan         Server 2           TS Gan         Server 3

Figure 11. Initial Register Status

61

### **Example Read Command**

To perform a read command, first power up the ADuM4177  $V_{DD1}/$  GND<sub>1</sub>,  $V_{DD2}/GND_2$ , and  $V_{SS2}/GND_2$ . For default UVLO values, recommended voltages are:

 $V_{DD1}/GND_1 = 5 V$ 

V<sub>DD2</sub>/GND<sub>2</sub> = 18 V

 $V_{SS2}/GND_2 = -4V$ 

Click **Read** button to read the single register that is found on the same line in the GUI.

2	is Window Help	
ADu	M4177 Customer Eval	uation Rev. 1.0 USB_SDP_CABLEZ Connected
	Read IC1 Revision 0	
Write		TSD1 Faut
Write	Read IC1 Digital Status C0000000 Fuse Unc. 8	Err 🕘 Fuse Corr. Err 🕘 PVM Fault 🕘 BIST Fault 1 🌒 CRC Fault 1 🌒 COM Fault 1 🌒
	Read PWN 1 Duty 20 0.0%	0.0*C
	Read PWH 2 Duty 50 0.0%	aand
	Read IC3 Revision 20	
Write		L EIT 🕐 DESAT 🌒 TSD2 🌑 OVP VSS2 🔮 UVLO VSS2 🔮 OVP VDD2 🔮 UVLO VDD2
Write	Read K3 Digital Status Seccoops U Unc 🕒 U	Corr 🔮 F Unc 🔮 F Corr 🔮 Prog Faut 🔮 BIST Faut 🌒 CRC Faut 🌑 COM Faut 🌑
Write	Read Control 50 Program ()	Simulate 2 🕘 Simulate 1 🕘
Write	Reed GAINT COCCODDS TS Cain	0000000
Write	Read OFFSETI COCCODDS TS Offse	et 00000000
Write	Read User Operating Mode 00000000 Unipolar 5	Inte D
Write		EN 🚳 En Desat BIST 🌑 Dis OSR Desat 🜑 Dis TS Comp Fit 🌑 TS Comp Thresh 🚺 00 Dis TS Cur 🜑
Write		The Desit Bank Select 000 VD02-VSS2 UVLO Select 000
vvnite		C Flag Denaid Blank Select 0000 V002-VSS2 UVLO Select 0000
Write		

Figure 12. Read Register Targets

To establish that the ADuM4177 GUI is communicating correctly with the ADuM4177, reading **IC1 Revision** and **IC3 Revision** show that the ADuM4177 is properly connected and powered up. The GUI displays a nonzero number in IC1 Revision and IC3 Revision output windows if SPI communication with the ADuM4177 is successful.

<ul> <li>♣ @</li> </ul>		
ADuM417	7 Customer	Evaluation Rev. 1.0 USB SDP. CABLEZ Connected
Read	CLI Revision #4	
Write Read	IC1 Analog Status	DT Fault () TSD1 Fault ()
Write Read	IC1 Digital Status	Fuse Linc, Err 🕒 Fuse Corr, Err 🕥 PWM Fault 🌑 BIST Fault 1 🔘 CRC Fault 1 🕲 COll Fault 1
	PWM 1 Duty 10	
Read		
Reed	PWW 2 Duty 0	0.0% 0.0°C
Read	C3 Revision #5	
Write Read	K3 Anakog Status 00000000	GH Err 🔮 GL Err 🔮 DESAT 🌒 TSD2 🌑 OVP VSS2 🕲 UVLD VSS2 🌑 OVP VDD2 🕥 UVLD VDD2
		an Er 🕐 GL Er 🗶 CESAT 🖉 TSG2 🗶 OVP VSS2 🖉 UVLO VSS2 💭 OVP VEG2 💭 UVLO VGG2 🌑 UVLO VGG2 🌑
Write Read	K3 Analog Status	
Write Read	IC3 Analog Status 00000000 IC3 Digital Status 00000000	U Unc 🌒 U Corr 🌑 F Unc 🌑 F Corr 🌑 Prog Faut 🌑 BIST Faut 🌑 CRC Faut 🌑 CON Faut
Write Read	IC3 Analog Status 00000000 IC3 Digital Status 00000000	U Unc 🌒 U Corr 🌑 F Unc 🌑 F Corr 🌑 Prog Faut 🌑 BIST Faut 🌑 CRC Faut 🌑 CON Faut
Write Read	IC3 Analog Status 00000000 IC3 Digital Status 00000000	U Unc 🌒 U Corr 🌑 F Unc 🌑 F Corr 🌑 Prog Faut 🌑 BIST Faut 🌑 CRC Faut 🌑 CON Faut
Virte Read Write Read Write Read	C3 Analog Status 00000000 K3 Digital Status 00000000 Centrol 00	Uloc () Love () For () For () For () For fact () SETFAC () CEFAC () CEFAC () Trype () Smart 2 () Smart 1 ()
Virite Read Virite Read Virite Read	C.3 Analog Status C.3 Analog Status C.3 Digital Status Centrol GAN1 GAN1 00000000	Unic & Form & Form & Form & High Fall & BOTFAUL & OD Frail & Confrail & Higher & Shawer 2 & Shawer 1 & Them
Vote Read	C3 Analog Status 00000000 C3 Digital Status 00000000 Centrol 0 GAR11 00000000 OFF5ET1 00000000	Uoc D. Corr D. Foc D. f. Corr D. High Fait B SCT Fait D. COC Fait D. Con Fait D. High Fait D. Schwarz D. Schwa
Write         Read           Write         Read           Write         Read           Write         Read           Write         Read           Write         Read           Write         Read	C3 Analog Datas gooccoo C3 Digits Status gooccoo Cettor go Cater gooccoo OFFECT gooccoo User Operating Mose Gooccoo	Voic & Lore & Foice & Foir & Highest & BOTANE & OCHAE & Confest Region & Seward & Seward & 19 date (190000) 19 date (190000) 19 date (190000) 19 date (190000) 19 date (190000)

Figure 13. Read IC1 and IC3 Revision Numbers

### **EXAMPLE EEPROM WRITE**

The sequence to write to nonvolatile memory is:

- 1. Write 1 to both simulate bits.
- 2. Write desired values to writable registers.
  - At this point, register effects show up on the ADuM4177 until a complete power cycle.
- 3. Write 1 to program bit, and both simulate bits at the same time.
  - At this point, register values and effects persist even after a power cycle.

To write data to the EEPROM, the **Sim\_Trim** bits must first be set. As shown in Figure 14, clicking either **Simulate 1** or **Simulate 2** indicator lights activate both. The value is not written to the ADuM4177 until the **Write** button is clicked.

Operate Tools Window Help			
	Customer	Evaluation Rev. 1.0	
	IC1 Analog Status	OT Fault 🕘 TSD1 Fault 🌒	
Write Read	IC1 Digital Status	Fuse Unc. Err 🕘 Fuse Corr. Err 🌑 PVM Faut 🌑 BIST Faut 1 🌑 CRC Faut 1 🜑 COM Faut 1 🜑	
Read	PWM 1 Duty	0.0% 0.0°C	
Read	PWM 2 Duty 2413	58.9% 40.2°C	
Read K	IC3 Revision 5 3 Analog Status 20000000	GH EM 🕐 OL EM 🌑 DESAT 🗑 TSD2 💭 OVP VSS2 🕒 UVLO VSS2 💭 OVP VDD2 🚭 UVLO VDD2	
Write Read IC:	3 Analog Status 00000000		
Write Read K	3 Analog Status 00000000 C3 Digital Status 00000000	U Line 🌒 U Corr 🌑 F Line 🕲 F Corr 🕲 Prog Fault 🕲 SIST Fault 🌑 CRC Fault 🕲 CON Fault 🌑	
Write Read C	Control 3 3	UUIC @ U Cor @ FOIC. @ FOIF & MISTEL @ SETTAL @ COCTAL @ COCTAL @ SENAR 2 SENAR 2 SENAR 1 @	
WVE Read	3 Anako Statan 0000000 C3 Dipta Statan 0000000 Centrol 13 GAN1 00000000		
WVE Read	3 Analog Status 00000000 C 3 Ogold Status 00000000 Casteri 0 3 GAR1 00000000 off SQT1 00000000	USUL & CONT PIEL & TOT & Instruct & SETTING CONTACT CONTACT DEFENSE Development Contract Con	
Wre Read C Wre Read C Wre Read C Wre Read C Wre Read C Wre Read C	3 Avate State (Concess) Control (Concess) Control (Concess) Cantol (Concess) Cantol (Concess) Cantol (Concess) Cantol (Concess) C	UDE D CHART FOR TOTAL DECIDATE CONTANT	

Figure 14. Simulate Bits

After **Write** is clicked, the **Program** indicator becomes dark as shown in Figure 15. This indicates that both Simulate 1 and Simulate 2 are **1**, and the ADuM4177 loads the registers given to it. If the registers are required to be written to nonvolatile memory, writing a **1** to **Program** saves the registers to EEPROM.

٠	w Help		
ADuM4		Evaluation Rev. 1.0	rected
Vivte Ree	d IC1 Analog Status	DT Faut () TSO1 Faut ()	
Wite Rea	d K1 Digital Status	Fuse Unc. Err 🕘 Fuse Corr. Err 🎱 PVM Fault 🕘 BIST Fault 1 🕘 CRC Fault 1 🌑 CR	DM Fault 1 🕥
Rea	d PWW 1 Duty	0.0% 0.0°C	
Rea	d PWW 2 Duty 2413	56.9% 40.2°C	
Virte Rea		GH Err 🕒 GL Err 🌑 DESAT 🕐 TSD2 🌑 OVP VSS2 🗶 UVLO VSS2 🌑 OVP VDD2 🌑 L	
Write Rea		GH Err & GL Err & DESAT #TSD2 # OVP VSS2 # UVLO VSS2 # OVP VDD2 # L U Unc & U Corr # F Unc # F Corr # Prog Faut # BIST Faut # CRC Faut # CO	
Virte Rea	d Control 3	Program ) Simulate 2 ) Simulate 1	
		$\smile$	
		TS Gain 00000000	
Write Rea	0 OFFSET1 00000000	TS Offset 00000000	
Write Rea			
	=	Unipolar Mode 🌑	
Wite Rea	d User Operating Mode 00000000	Ungolar Mode 🌒 ASC Den EN 🔮 En Desat BIST 🔮 Dis GSR Desat 🔮 Dis TS Comp Fit 🌒 TS Comp Thr	esh 🛛 Co 🔹 Dis TS Cur 🌑
Write Rea	d User Operating Mode 000000000		esh 🛛 💿 Dia TS Cur 🌑

Figure 15. After Write is Clicked on Control Register

The following example loads a changed register into nonvolatile memory. In this example, TS Gain is set to **00000011**. As shown in Figure 16, enter the desired value into the **TS Gain** field (marker with red arrow), and click **Write** button (marked with another red arrow).

AD	uM417	77 Customer	Eval	luation Rev. 1.0 USB SDP CABLEZ Connected
	Read	IC1 Revision	1	
Write	Read	IC1 Analog Status 00000000	OT Fault	TSD1 Faut
Witte	Read	IC1 Digital Status	Fuse Unc. 6	Err 🕘 Fuse Corr. Err 🌑 PVM Faut 🌑 BIST Faut 1 🌑 CRC Faut 1 🌑 COM Faut 1 🌑
	Read	PWM 1 Duty 0	0.0%	0.0*C
	Read	PVM 2 Duty 2413	53.9%	40.2°C
	Read	IC3 Revision		
Witte	Read	K3 Analog Status 00000000	GH Err 🕥 GL	BL EM 🎱 DESAT 🌒 TSD2 🌒 OVP VSS2 🌒 UVLO VSS2 🌑 OVP VDD2 🌑 UVLO VDD2 🚳
		IC3 Digital Status 00000000	U Unc 🕥 U I	U Corr 🌒 F Unc 🌒 F Corr 🌒 Prog Fault 🌑 BIST Fault 🌑 CRC Fault 🕲 COM Fault 🕲
Write	Read			
Witte Witte	Read	Control 3	Program 🕥	Simulate 2 🥥 Simulate 1 🥥
		Control []3	Program 🌑	
		Control [3	Program 🌑	
		Control 3 CANN1 00000011		
Write	Read	Ŷ	T5 Gain	Sinuare 2 🌒 Sinuare 1 🌒
Virte	Read	GAN1 00000011	T5 Gain	
Virte Virte	Read Read Read	CAN1 00000011	TS Gain TS Offse Unipolar M	
Vinte Vinte Vinte	Read Read Read Read Read	CAN1 0000001 0//SET 00000000	TS Gain TS Offse Unipoler M ASC Dom	traver 2 & traver 1 &

Figure 16. Setting TS Gain to 00000011

At this point, the effects of the TS Gain change can be shown on the ADuM4177 GUI. As shown in Figure 16, the value is reported in the field circled with red. If a power cycle occurs, the register resets to the previous value in the EEPROM.

Setting the Program bit to **1**, and keeping the simulate bits set to **1**, and then click **Write** to program the registers to EEPROM as shown in Figure 17.

۲	ools Window H		
AD	uM417	7 Customer	Evaluation Rev. 1.0 USB SDP CABLEZ Connected
	Read	ICI Revision #4	
Virite	Read	IC1 Analog Status	DT Fault 🕥 TSD1 Fault 🌑
Write	Read	IC1 Digital Status	Fuse Unc. Err ) Fuse Corr. Err ) PMII Faut ) BIST Faut 1 ) CRC Faut 1 (COII Faut 1
	Read	PVM 1 Duty 0	10.0% 0.0°C
	Reed	PWW 2 Duty 2413	58.9% 40.2*C
		1	- Justice - Justice
	Read	C3 Revision	
Virte	Read	KC3 Analog Status 00000000	GH Err 🜑 GL Err 🜑 DESAT 🜑 TSD2 🜑 OVP VSS2 🜑 UVLO VSS2 🜑 OVP VDD2 🜑 UVLO VDD2
Virte	Read	IC3 Digital Status 00000000	U Unc 🌑 U Cerr 🌑 F Unc 🜑 F Cerr 🕥 Prog Fault 🕥 BIST Fault 🌑 CRC Fault 🔘 COM Fault 🌑
	Read		
Virte		IC3 Digital Status 00000000	U Unc 🌑 U Cerr 🌑 F Unc 🜑 F Cerr 🕥 Prog Fault 🕥 BIST Fault 🌑 CRC Fault 🔘 COM Fault 🌑
Virte		IC3 Digital Status 00000000	U Unc 🌑 U Cerr 🌑 F Unc 🜑 F Cerr 🕥 Prog Fault 🕥 BIST Fault 🌑 CRC Fault 🔘 COM Fault 🌑
Write Write	Read	C3 Digital Status	USIC & LOFF & FINC & FORF & NIG Fack & SOTFack & ODEFack & CORFack & NIGHT & STARE 2 STARE 1 &
Wite Write	Read	K3 Dipter Status 0000000	Use & Use & For & For & For & For Fac & Stiffer & Stiffe
Virite Virite Virite Virite Virite Virite	Read Read Read	C3 Diplets Status (0000000) Control (7 GAM1) 00000001 GAM1 00000001 User Operating Mode (0000000)	USE U CIT # FINA # FCH # NUFFAR # SSTFAR # OFFAR # CONTAR # Program Senta 3 Senta 1 S To m S
Wite Wite Wite Wite Wite Wite Wite Wite	Read Read Read Read Read	C3 Dytat fana 0000000 Costel 7 GAN1 00000011 075ET1 0000000 User Opening Stole 0000000 User Opening Stole 0000000	
Virite Virite Virite Virite Virite Virite	Read Read Read Read	C3 Diplets Status (0000000) Control (7 GAM1) 00000001 GAM1 00000001 User Operating Mode (0000000)	USE U CIT # FINA # FCH # NUFFAR # SSTFAR # OFFAR # CONTAR # Program Senta 3 Senta 1 S To m S

Figure 17. Programming Values to EEPROM

To verify that the programming is complete (as shown in Figure 18), click **Read** button and verify that the **Program** indicator light is off.

		uation Rev. 1.0.			- 0	×
1.00	Operate Tools	Window Help	P			
	• @ 😑					
[	ADuN Wree	A417	C Customer	Evaluation Rev. 1.0 UR 309 CALLEZ Connected	•	
		NC BU	-	June C		
		Read	PWM 2 Duty 2413	58.9% 40.2°C		
[	Write	Read		GH EIT 🕘 GL EIT 🌑 GESAT 🌑 1502 🌑 GVP V552 🜑 UVLO V552 🌑 GVP V002 🌑 UVLO V6	-	
[	Wrte	Read	IC3 Digital Status 00000000	U Unc 🕘 U Corr 🎱 F Unc 🌑 F Corr 🕘 Prog Fault 🌑 BIST Fault 🎱 CRC Fault 🕲 COM Fault 🌒		
ſ	West	Read	Control 1	Program () Simulate 2 ) Simulate 1		
					_	
-	Write	Read	GAN1 00000011	TS Gain 00000011		
[	Write	Read	OFFSET1 00000000	TS Offset 00000000		
[		Read	User Operating Mode 00000000	Unipolar Mode 🌑		
	Write			ASC Dom EN () En Desat BIST () Dis GSR Desat () Dis TS Comp Fit () TS Comp Thresh	Dis TS Cur	
	Write	Read	User Config 1 00000000			
		Read	User Config 1 00000000	Enable CRC Flag  Desat Blank Select  000 VCD2-VSS2 UVLO Select  000		
	Wite					

Figure 18. Verify Programming Complete

At this point, after a power cycle, the TS Gain value is set to **00000011**. For this exercise, power the ADuM4177 down. As shown in Figure 19, click all **Read** buttons and note the outputs. They should be all **0**. This is because the ADuM4177 is unpowered.

• 🅸 🍘		
ADuM417	7 Customer	Evaluation Rev. 1.0 USB SDP CABLEZ Connected
Read	C1 Revision 0	•
Write Read	K1 Analog Status	DT Fault 🕘 TSD1 Fault 🌒
Write Read	IC1 Digital Status	Fuse Unc. Err 🕘 Fuse Corr. Err 🕘 PNM Faut 🕘 BIST Faut 1 🌒 CRC Faut 1 🌑 COM Faut 1 🜑
Read	PWM 1 Duty 0	0.6% 0.0*C
Read	PWM 2 Duty	0.0% 0.0°C
Read	C3 Revision 0	>
Write Read	IC3 Analog Status 00000000	GH Err 🔮 GL Err 🔮 DESAT 🌑 TSD2 🕘 OVP VSS2 🛞 UVLO VSS2 🌑 OVP VGD2 🕲 UVLO VDC2 🕲
Write Read	IC3 Digital Status	U Unc 🔮 U Corr 🔮 F Unc 🔮 F Corr 🔮 Prog Faut 🎱 BST Faut 🎱 CRC Faut 🔮 COll Faut
Write Read	Control 0	Program 🍈 Semulate 2 🚳 Semulate 1 🜑
Write Read	GAIN1 00000000	TS Gam 0000000
Write Read	OFFSET1 00000000	TS Offset 00000000
Write Read	User Operating Node	Unipolar Node 🕘
Write Read	User Config 1 00000000	ASC Don EN 🕘 En Desat BIST 🌑 Dis GSR Desat 🎱 Dis TS Comp Fit 🌑 TS Comp Threat 🚺 Dis TS Cur 🌑
VITE HERD.	User Config 2 0000000	Enable CRC Flag Desat Blank Select 000 V002-VSS2 UVL0 Select 000
Write Read	and and a grantee	

Figure 19. Clearing the Register Read in the GUI

Power up the ADuM4177 and as shown in Figure 20, click **Read** buttons to verify values are written to the EEPROM, and return to the registers on power up.

🔿 🖗 💼	4p	
ADuM417	7 Customer	Evaluation Rev. 1.0
Write Read	IC1 Analog Status	DT Fault 🌒 TSD1 Fault 🕘
Write Read	IC1 Digital Status	Fuse Unc. Err 🕘 Fuse Corr. Err 🎱 PNN Faut 🎱 DIST Faut 1 🕘 CRC Faut 1 🌑 COM Faut 1 🜑
Read	PWM 1 Duty	0.0% 0.0.°C
Read	PWM 2 Duty	59.8% 34.5°C
Write Read	K3 Analog Status	CH Err 🜑 GL Err 🜑 DESAT 🜑 7502 🜑 OVP V352 🚳 UVLO V552 🜑 OVP V002 🜑 UVLO V002
Write Read	IC3 Digital Status	U Unc O U Corr O F Unc O F Corr O Prog Fault O BST Fault O CRC Fault O CON Fault O
Write Read	IC3 Digital Status	Uller & Uller & Flore & Flore Reg Fast & BSTFast & CRCFast & CONFast &
	-	
Write Rest	Control	Propen 🌚 Smalet 2 🔮 Smalet 1 🖗
Write Read	Control 0 GAINT 00000011	Properti 🕘 Senales 2 🖨 Senales 1 🖨
Write Resd	Control 0 GARI 00000011 OFFSET 0000000	Propertie Servate 2 Servate 1 Servate 1 Servate 2 Servate 2 Servate 1 Servate 2 Servat
Write Read Write Read Write Read	Control 0 GAINE 00000011 OFFSET1 00000000	Properties Service 2 Service 1 Service 2 Service 1 Service 2 Service 2 Service 1 Service 2 Servi

Figure 20. TS Gain Register Loaded on Startup

You have now successfully written to EEPROM and verified the write.

# EXAMPLE VDD2\_UVLO\_SLCT EEPROM WRITE

The following steps show how to program the nonvolatile memory with a new UVLO setting on  $V_{DD2}$ . The same steps can be used to program other user selectable registers.

The sequence to write a new V<sub>DD2</sub> UVLO to nonvolatile memory is:

- 1. Write 1 to both simulate bits.
- 2. Write desired V<sub>DD2</sub> UVLO values to writable registers.
  - At this point, register effects show up on the ADuM4177 until a complete power cycle.
- 3. Write 1 to program bit, and both simulate bits at the same time.
  - At this point, register values and effects persist even after a power cycle.

To write data to the EEPROM, the **Sim\_Trim** bits must first be set. As shown in Figure 21, clicking either **Simulate 1** or **Simulate 2** indicator lights activate both. The value is not written to the ADuM4177 until the Write button is clicked.

Edit Operate Tools Window Help		-
→ ② ●		
		•
Read	PWW 1 Duty 0 0.00°C PWW 2 Duty 2213 55.9% 40.2°C	_
Read	C3 Revision ge	
Write Read	IC3 Anales Status (00000000) GH Err 👻 OL Err 🕒 DESAT 🖉 TSO2 🌑 OVP VSS2 💭 UVLO VSS2 🗶 OVP VSO2 💭 UVLO V IC3 Digital Status (00000000) U Uinc 🕲 U Corr 🕐 F Unc 🍘 F Corr 🖗 Prog Faut 🕲 DIST Faut 🌑 COIL Faut 🕲 COIL Faut	-
		-
Write Read		-
Wite         Read           Wite         Read           Wite         Read           Wite         Read	Cl Devel State 3000000 Cl Devel State 3000000 U U C V Orr 0 100 0 F C V Or 0 Porto 0 State 1 0 Correct 3000000 OFECT 3000000 T Ore 0 State 1 0 T Ore 0 State 1	-
Wite Bead Wite Bead Wite Bead Wite Bead Wite Bead Wite Bead	CD DMM DMM groups         Usecon         Usecon         Usecon         Figure         Program         Program         Description         Program         Contract	_
Wite         Read           Wite         Read           Wite         Read           Wite         Read	Cl Devel State 3000000 Cl Devel State 3000000 U U C V Orr 0 100 0 F C V Or 0 Porto 0 State 1 0 Correct 3000000 OFECT 3000000 T Ore 0 State 1 0 T Ore 0 State 1	_

Figure 21. Simulate Bits

In this example, as shown in Figure 22, VDD2\_UVLO\_SLCT is set to 000. Enter 000 value into the VDD2-VSS2 UVLO Select field, and click Write button.

🔿 🌚 🥌	Help		
ADuM41	77 Customer	Evaluation Rev. 1.0	
Write Read	KC1 Analog Status	DT Faut 🕘 TSD1 Faut 🔘	
Write Read	IC1 Digital Status 00000000	Fuse Unc. Err 🕘 Fuse Corr. Err 🕘 PV/M Faut 🌒 BIST Faut 1 🌒 CRC Faut 1 🎱 COM Faut 1	•
Read	PVM 1 Duty	0.0% 0.0°C	
Read	PWM 2 Duty 2448	59.8% 34.5°C	
			-
Read	IC3 Revision		
Write Read	IC3 Analog Status 0000000	GH Err 🌑 GL Err 🕲 DESAT 🌑 TSD2 🕥 OVP VSS2 🕥 UVLO VSS2 🌑 OVP VDD2 🎱 UVLO VD	22 🕘
Witte Read	IC3 Digital Status	U Unc 🕚 U Corr 🌑 F Unc 🌑 F Corr 🌑 Prog Faut 🕲 BIST Faut 🌑 CRC Faut 🕲 CON Faut	
Witte Read	Control 3	Program 🕘 Simulate 2 🥥 Simulate 1 🥥	
Write Read	GAIN1 000000011	TS Gain 00000011	-
Write Read	OFFSET1 00000000	TS 0/het 00000000	
	User Operating Mode 00000000	Unipolar Mode	
Write Read	User Config 1 01000000	ASC Dom EN	Dis TS Car
Write Read			
	User Config 2 0001000	Enable CRC Flag  Desat Blank Select	

Figure 22. Setting VDD2\_UVLO\_SLCT to 000

At this point, if a power cycle occurs, the register is reset to the previous value in the EEPROM. For the purpose of this exercise, keep the ADuM4177 powered up.

Setting the Program bit to 1, and keeping the simulate bits set to 1 show the result as shown in Figure 23. Click **Write** to program the registers to EEPROM, and see the result in the **Program** control being grayed out as shown in Figure 24. This is to signify the GUI does not expect the user to attempt to control the value of Program at this point.

٠	Window Help	•								
ADu	M4177	7 Customer	Evalu	ation	Rev. 1.0	US	SDP_CABLEZ Com	nected		
[	Read	IC1 Revision	T			•				
Wyte	Read	IC1 Analog Status	DT Faut 🕥	TSD1 Faut 🕘						
Witte	Read	IC1 Digital Status	Fuse Unc. Err	Fuse Corr. Er	r 🔮 PWM Faut 🌒 BS	ST Fault 1 🔘	CRC Fault 1 🕥 O	OM Fault 1 🔘		
	Read	PWM 1 Duty	0.0%	0.0°C						
[	Read	PWM 2 Duty 2448	59.0%	34.5°C						
	Read	IC3 Revision								
Write		IC3 Analog Status		-	rsoz 🕘 ov# vssz 🕘					
Witte	Read	IC3 Digital Status	U Une 🕥 U Co	rr 🕐 F Unc 🕥 I	F Corr 🕘 Prog Fault 🌑					
			U Une 🕥 U Co	-	F Corr 🕘 Prog Fault 🌑					
Witte	Read	IC3 Digital Status	U Une 🕥 U Co	rr 🕐 F Unc 🕥 I	F Corr 🕘 Prog Fault 🌑					
Witte	Read	IC3 Digital Status	U Une 🕥 U Co	rr 🎱 F Unc 🌒 I Simulate 2 🥚 Sa	F Corr 🕘 Prog Fault 🌑					
Wite	Read	Control 7	U Unc O U Co Program O C	rr 🎱 F Unc 🌒 I Simulate 2 🥚 Sa	F Corr 🕘 Prog Fault 🌑					
Wite	Read Read Read Read	C3 Digital Status 00000000	U Unc O U Co Program O C	er   F Unc  F Unc  Smulate 2  Sa  Sa  CCCCCC00111  CCCCCCCCC	F Corr 🕘 Prog Fault 🌑					
Wite	Read Read Read Read	C.3 Digital Status 00000000 Central 7 CAAN1 000000011 OFFSET1 00000003	U Unc O U Co Program O 1 C TS Gain TS Offset Unipolar Mod	rr  F Unc  I Smulate 2 Second 11 CCCCCCC 11 CCCCCCCC CCCCCCC CCCCCCCC	F Corr 🕘 Prog Fault 🌑	BIST Faut	CRC Fault 🌑 CO	M Faut 🌒	175 Cur (	
Wite	Read Read Read Read Read	C3 Digital Status 0000000 Central 7 GARH 0000001 OFFIST1 0000000 seer Operating Mode 0000000	U Unic O U Co Program O T TS Gain TS Office Unipolar Mod ASC Dem EN	rr  F Unc  I Smullete 2 Se	F Corr 🌒 Prog Fault 🌒	DIST Fault	CRC Faut CC	M Faut 🌒	t TS Car	•

Figure 23. Preparing to Write to EEPROM, Write is Not Clicked Yet

	M4177	7 Customer	Evaluation Rev. 1.0 USB SOP CABLEZ Connected		Î
	Read	ICI Revision	•		
Witte	Read	IC1 Analog Status	DT Fast 🕘 TSD1 Feut 🕘		
Wrbe	Read	IC1 Digital Status	Fuse Unc. Err 🕘 Fuse Corr. Err 🕘 PWM Faut 🎱 BIST Faut 1 🕘 CRC Faut 1 🎱 COM Faut 1	•	
	Read	PWM 1 Duty	0.0% 0.0°C		
	Read	PWN 2 Duty 2448	59.8% 34.5°C		
			,	-	
	Read	IC3 Revision			
Wirte	Read	IC3 Analog Status	GH Err 🌑 GL Err 🌑 DESAT 🌑 TSD2 🌑 OVP VSS2 🜑 UVLO VSS2 🌑 OVP VDD2 🕥 UVLO VDD		
Witte	Read	IC3 Digital Status	U Linc 🕒 U Corr 🌑 F Linc 🕥 F Cerr 🕥 Prog Fault 🌑 DIST Fault 🌑 CRC Fault 🎱 CON Fault		
- Write	Read	Control #7	Program 🕘 Inulate 2 🥥 Simulate 1 🥥		
				_	
Write	Read	GAIN1 00000011	TS Gein 00000011		
	Read	OFFSET1 00000000	TS Offset 20000000		
Wite	nee0				
		Iser Operating Mode	Unipolar Mode 🚳		
Write		Iser Operating Mode CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	Ungolar Mode 🚳	Dis TS Cur 🕘	
Wiribe Wiribe	Read		•	Dis TS Cur 🌑	

Figure 24. Clicking Write to Program EEPROM

To verify that the programming is complete, as shown in Figure 25, click **Read** button and verify that the **Program** indicator light is off.

+ @ @				- 1
ADuM4177 Cu	ustomer Evalua	tion Rev. 1.0	USB SDP CABLEZ Connected	1
Read	Revision 4		•	
Write Read K1 Analo	og Status 00000000 DT Faut 🕘 TSD1	faut 🕘		
Write Read IC1 Digit	tal Status	Fuse Corr. Err 🕘 PVM Faut 🌒 BIST Fau	it 1 🕘 CRC Fault 1 🕘 COM Fault 1 🚇	
Read	1 Duty 0.0%	rc -		
Read	11 2 Duty 2413 58.9% 40.	2°C		
Read KC3 R	evision 26			
Write Read IC3 Aralog	Status 00000000 GH Err 🕥 GL Err 🌒	DESAT TSD2 OVP VSS2 OVVLO	VS52 🕘 OVP VDD2 🕥 UVLO VDD2 🔘	
Write Read IC3 Digital	Status 00000000 U Unc 🕥 U Cerr 🔘	F Unc 🕘 F Corr 🕘 Prog Fault 🌑 BIST	Faut 🕘 CRC Faut 🎱 COM Faut 🕘	
With Read	Control 1 Program Dimute	te 2 🥥 Simulate 1 🥥		
Write Read	GAIN1 00000011 TS Gain 0000			
Write Read	DFFSET1 00000000 TS Offset 0000	00000		
	ing Made 000000000 Unipolar Mode 🔘			
Write Read User Operat			S Comp Fit 🌒 TS Comp Thresh 🚺 CO Dr	s TS Cur 🕥
	Cenfg 1 00000000 ASC Dom EN	En Desat BIST 🕘 Dis GSR Desat 🌚 Dis T		
Write Read User	-	En Desat BIST O Dis GSR Desat O Dis T Desat Blank Select 0000 VCD2-VSSJ	UVLO Select	

Figure 25. Verify Programming Complete

At this point, after a power cycle, the VDD2\_UVLO\_SLCT value is set to **000**. For this exercise, power the ADuM4177 down. Power the ADuM4177 up, and as shown in Figure 26, click **Read** button to verify that the values are written to the EEPROM, and return to the registers on power up.

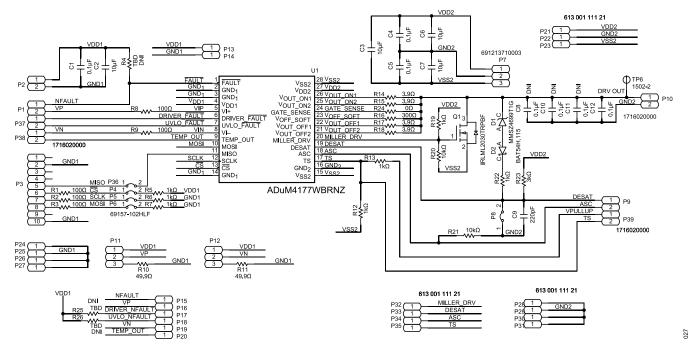
• @ 🖲	leip		
ADuM417	77 Custome	r Evaluation Rev. 1.0 USB SDP. CABLEZ Connected	
Read	IC1 Revision	•	
Write Read	IC1 Analog Status	DT Fault 🌒 TSD1 Fault 🌑	
Write Read	IC1 Digital Status	Fuse Unc. Err 🗶 Fuse Corr. Err 🗶 PMM Fault 🕘 BIST Fault 1 🔮 CRC Fault 1 🔮 COll Fault 1 🌑	
Read	PWW 1 Duty	0.0% 0.0°C	
Read	PWM 2 Duty 2448	59.0% [34.5*C	
_	_		
Read	IC3 Revision 6		
Winte Read	IC3 Analog Status 00000000	OH Err 🕘 OL Err 🕘 DESAT 🌒 TSD2 🎱 OVP VSS2 🔮 UVLO VSS2 🌑 OVP VDD2 🔮 UVLO VDD2	
Write Read	IC3 Digital Status 00000000	U Unc 🌒 U Corr 🌒 F Unc 🌒 F Corr 🌒 Prog Fast 🎱 BIST Faut 🌑 CRC Fast 🌑 COM Fast 🌑	
Virte Read	Control 0	U Uno 🔍 U Con 🔿 F Uno 🕥 F Con 😨 Prog Paut 🌑 BIST Faut 🕲 CRC Faut 🌑 COM Faut 🌑 Program 🛞 Simulate 2 🕥 Simulate 1 🗨	
	-		
Virte Read	Control 0	Pogran 🔮 Simuela 2 🖨 Simuela 1 🖨	
Write Read	Control 0 GAN1 00000011	Tropen 🕢 Seven I 化	
Wite Read	Control 0 GAM1 00000011 OFFSET1 00000000	Trace	
Write Read	Central 0 GAR11 00000011 OFFSET1 00000000 User Operating Mode 00000000	Trigon () Shake 2 () Shake 1 ()	
Wite Read	Control 0 GAM1 00000011 OFFSET1 00000000	Trigon () Shake 2 () Shake 1 ()	r @
Wints Read Wints Read Wints Read	Central 0 GAR11 00000011 OFFSET1 00000000 User Operating Mode 00000000	Trigon () Shake 2 () Shake 1 ()	r 🚳

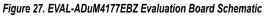
Figure 26. VDD2\_UVLO\_SLCT Register Loaded on Startup

026

You have now successfully written to EEPROM and verified the write. At this point, the UVLO value for  $V_{\text{DD2}}$  is lowered from the default value.

# **EVALUATION BOARD SCHEMATIC AND ARTWORK**





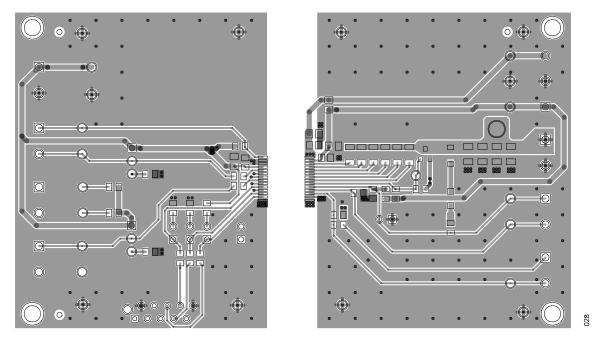


Figure 28. EVAL-ADuM4177EBZ Evaluation Board Top Layer Layout

### **EVALUATION BOARD SCHEMATIC AND ARTWORK**

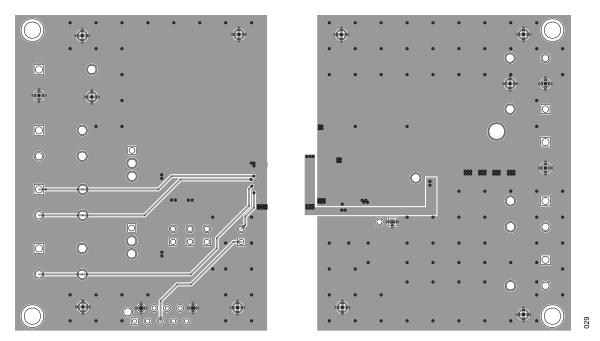


Figure 29. EVAL-ADuM4177EBZ Evaluation Board Bottom Layer Layout

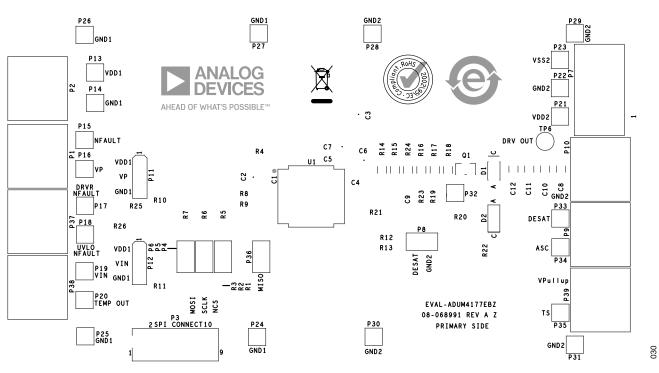


Figure 30. EVAL-ADuM4177EBZ Evaluation Board Top Layer Silkscreen

### **ORDERING INFORMATION**

### **BILL OF MATERIALS**

#### Table 1. EVAL-ADuM4177EBZ Bill of Materials

Item	Quantity	Reference Designator <sup>1</sup>	Part Description	Manufacturer, Part Number
Required Circuit Components				
1	1	N/A	PCB	Analog Devices Inc., 08_068991a
2	1	C1	Capacitor, ceramic, 0.1 µF, 50 V, 5%, X7R, 0805	AVX Corporation, 08055C104JAT2A
4	1	C12	Capacitor, ceramic, 0.1 µF, 50 V, 10%, X7R, 1206	Yageo, CC1206KRX7R9BB104
5	4	C2, C3, C6, C7	Capacitors, ceramic, 10 µF, 25 V, 10%, X5R, 0805	TDK, C2012X5R1E106K125AB
6	2	C4, C5	Capacitors, ceramic, 0.1 µF, 50 V, 5%, X7R, 0805	Kemet, C0805C104J5RACTU
7	1	C9	Capacitor, ceramic, 220 pF, 50 V, 5%, C0G, 0805	Yageo, CC0805JRNPO9BN221
8	1	D1	Zener diode, 12V, 5%, 0.5 W, SOD-123	Onsemi, MMSZ4699T1G
9	1	D2	Schottky diode barrier, 30 V	NXP Semiconductors, BAT54H,115
10	7	P1, P2, P9, P10, P37, P38, P39	Connectors, fixed terminal blocks, PCB mount, pitch 5.08 mm, 2 poles	Weidmuller, 1716020000
11	2	P11, P12	Connectors, PCB header strips, 2.54 mm pitch, male, straight mounting angle, 3 poles	Samtec, TSW-103-08-G-S
12	23	P13 to P35	Connectors, PCB pin headers, 2.54 mm pitch, male, straight mounting angle, 1 pole	Wurth Elektronik, 61300111121
13	1	P3	Connector, board-to-board application, mezzanine micro-match, 1.27 mm pitch, female, straight mounting angle, 10 poles	TE Connectivity, 8-215079-0
14	5	P4, P5, P6, P8, P36	Connectors, board-to-board application, BERGSTIK series, 2.54 mm pitch, male, straight mounting angle, 2 poles	Amphenol FCI, 69157-102HLF
15	1	P7	Connector, PCB fixed terminal block, 5 mm pitch, straight mounting angle, 3 poles, wire gauge 16 AWG (min) and 26 AWG (max)	Wurth Elektronik, 691213710003
16	1	Q1	Transistor, NMOSFET, HEXFET power MOSFET, 30 V	Infineon Technologies AG, IRLML2030TRPB
17	5	R1, R2, R3, R8, R9	Resistors, SMD, 100 Ω, 1%, 1/8 W, 0805, AEC-Q200	Panasonic, ERJ-6ENF1000V
18	2	R10, R11	Resistors, SMD, 49.9 Ω, 1%, 1/8 W, 0805, AEC-Q200	Panasonic, ERJ-6ENF49R9V
19	3	R12, R13, R19	Resistors, SMD, 1 kΩ, 1%, 1/2 W, 0805, AEC-Q200	Vishay, CRCW08051K00FKEAHP
20	4	R14, R15, R17, R18	Resistors, SMD, 3.9 Ω, 1%, 1/4 W, 1206, AEC-Q200	Panasonic, ERJ-8RQF3R9V
21	1	R16	Resistor, SMD, 300 Ω, 1%, 1/4 W, 1206, AEC-Q200	Vishay, CRCW1206300RFKEA
22	2	R20, R21	Resistors, SMD, 10 kΩ, 1%, 1/8 W, 0805, AEC-Q200	Panasonic, ERJ-6ENF1002V
23	4	R5, R6, R7, R22	Resistors, SMD, 1 kΩ, 1%, 1/8 W, 0805, AEC-Q200	Panasonic, ERJ-6ENF1001V
24	1	R23	Resistor, SMD, 3 kΩ, 0.1%, 1/4 W, 0805, AEC-Q200	Panasonic, ERJ-PB6B3001V
25	1	R24	Resistor, SMD, 0 Ω, 5%, 1/4 W, 206, AEC- Q200	Vishay, CRCW12060000Z0EA

#### **ORDERING INFORMATION**

#### Table 1. EVAL-ADuM4177EBZ Bill of Materials (Continued)

ltem	Quantity	Reference Designator <sup>1</sup>	Part Description	Manufacturer, Part Number
27	1	TP6	Terminal turret connector single end 0.219" (5.56 mm) Tin, board thickness 0.062" (1.57 mm), brass, through hole mounting type	Keystone Electronics, 1502-2
28	1	U1	IC, 40 A source/30 A sink SiC isolated gate driver with slew-rate control and built-in self tests	Analog Devices Inc., ADuM4177WBRNZ
Mechanical Parts				
2	4	N/A	Threaded hex standoff nylon, female, outside diameter 0.25" (6.35 mm), thread size 4 to 40, length 0.5" (12.7 mm)	Keystone, 1902C
3	4	N/A	Pan head machine screw phillips driven nylon, thread size 4 to 40, length 0.250" (6.35 mm)	B&F Fastener Supply, NY PMS 440 0025 PH
4	7	N/A	Shunt, 3 A, 2.54 mm pitch, open top grip, black, female, 2 poles	TE Connectivity, 881545-2

<sup>1</sup> N/A = Not applicable



#### ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

#### Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NONINFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.



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