User's Guide
SBAU292B–August 2017–Revised March 2018

BOOSTXL-ADS7142 BoosterPack™ Plug-In Module

The ADS7142 BoosterPack™ Plug-in Module (BOOSTXL-ADS7142) allows users to evaluate the functionality of Texas Instruments' ADS7142 nanopower, dual-channel programmable sensor monitor. This user's guide describes both the hardware platform showcasing the ADS7142 device and the graphical user interface (GUI) software used to configure the various modes of operation of this device.

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1 Introduction

The ADS7142 BoosterPack is a fully-assembled evaluation platform designed to highlight the ADS7142 device features and various modes of operations that makes this device suitable for ultra-low-power, small-size sensor monitor applications.

The accompanying TM4C1294 LaunchPad™ Development Kit (EK-TM4C1294XL) is used as a USB-to-PC GUI communication bridge, and example implementation of a master MCU to communicate with the ADS7142 through its I^2C interface.

NOTE: The BOOSTXL-ADS7142 requires an external master controller to evaluate the ADS7142.

The EK-TM4C1294XL is controlled by commands received from the ADS7142 GUI, and returns data to the GUI for display and analysis. If the EK-TM4C1294XL is not used, the BoosterPack plug-in module format of the BOOSTXL-ADS7142™ board allows an alternative external host to communicate with the ADS7142.

The BOOSTXL-ADS7142 incorporates all required circuitry and components with the following features:

- ADS7142 nano power, ultra-small, dual-channel sensor monitor with I^2C interface and alert output
- Optional low power voltage reference, TI's REF3330, to generate a 3-V output to power the ADS7142 AVDD supply pin when using 3.3 V from TM4C1294 LaunchPad
- Optional adjustable linear regulator, TI's TPS78001, to generate stable output voltage to power the ADS7142 DVDD pin when using the 5-V USB power from the TM4C1294 LaunchPad
- I^2C interface for communication and configuration of modes available on the ADS7142

Figure 1 shows the ADS7142 EVM architecture, identifying the key components and blocks previously listed.

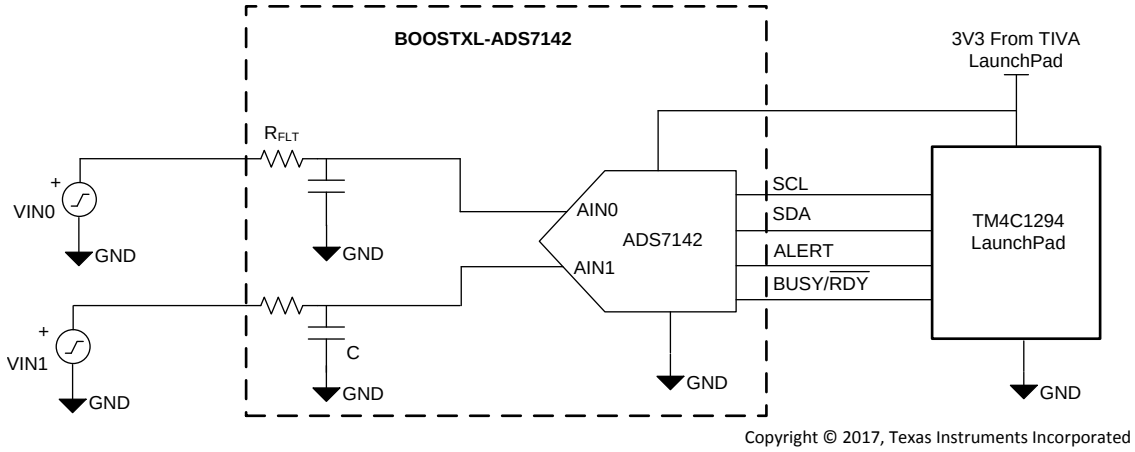

Figure 1. ADS7142 EVM Block Diagram

2 BOOSTXL-ADS7142 EVM Overview

This section describes various onboard components that are used to interface analog input, digital interface, and provide power supply to BOOSTXL-ADS7142. Figure 2 shows a BOOSTXL-ADS7142 overview.

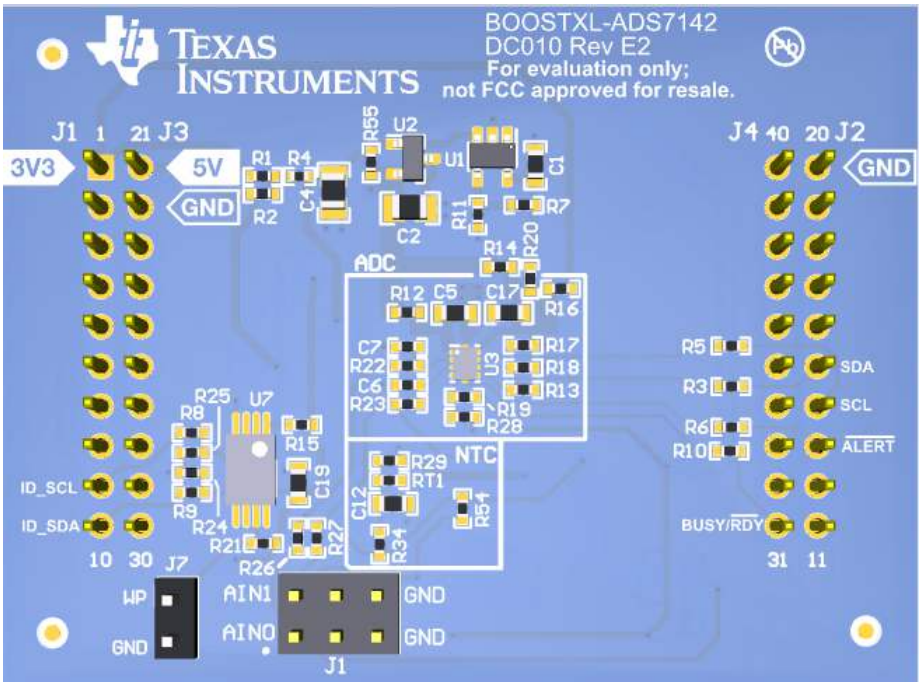

Figure 2. BOOSTXL-ADS7142 Top Level Overview

2.1 Connectors for Single-Ended Analog Input

The BOOSTXL-ADS7142 is designed for easy interface to an external, analog, single-ended source through a 100-mil header. Connector J1 allows analog source connectivity. Table 1 lists the analog input connector and input channel configuration.

Table 1. Input Connector and Channel Configuration

J1 Connector Pin	Description
J1:1	Single-ended analog input for channel 0 of ADC
J1:2	Single-ended analog input for channel 1 of ADC
J1:3 and J1:4	NC
J1:5 and J1:6	BoosterPack ground

2.2 Digital Interface

As noted in Section 1, the BOOSTXL-ADS7142 interfaces with the EK-TM4C1294XL LaunchPad, which in turn communicates with the computer over USB. The two devices on the booster pack that the TM4C1294 communicates with are the ADS7142 ADC (over I^2C) and the EEPROM (over a secondary I^2C). The EEPROM comes preprogrammed with the information required to configure and initialize the BOOSTXL-ADS7142 platform. Once the hardware is initialized, the EEPROM is no longer used.

2.3 ADS7142 Digital I/O Interface

The BOOSTXL-ADS7142 supports the 12C digital interface and functional modes as detailed in the ADS7142 device data sheet (SBAS773). The TM4C1294 LaunchPad is capable of operating at a 3.3-V logic level and is directly connected to the digital I/O lines of the ADC.

2.4 Power Supplies

The device supports a wide range of operation on its analog supplies. The AVDD can operate from 1.65 V to 3.6 V. The DVDD operates from 1.65 V to 3.6 V, independent of the AVDD supply. The 3.3-V voltage regulator available on the EK-TM4C1294XL is used to supply 3.3 V to both AVDD and DVDD on the BOOSTXL-ADS7142.

There is an onboard option to use an ultra-low power voltage reference REF3330 (U2) to generate 3-V supply for the ADS7142 AVDD pin. Voltage variants of REF3330 can be used to generate supply other than 3 V for the ADS7142 AVDD pin. To generate a DVDD supply other than 3.3 V, an adjustable version of the TPS78001 regulator (U1) can be used.

3 BOOSTXL-ADS7142 EVM Initial Setup

3.1 ADS7142 Graphical User Interface Software Installation

The following steps describe the ADS7142 GUI software installation:

1. Download the latest version of the EVM graphical user interface (GUI) installer from the *Tools and Software* folder of the device, and run the GUI installer to install the EVM GUI software on your computer.
2. Accept the *License Agreements* and follow the on-screen instructions to complete the installation (see Figure 3).

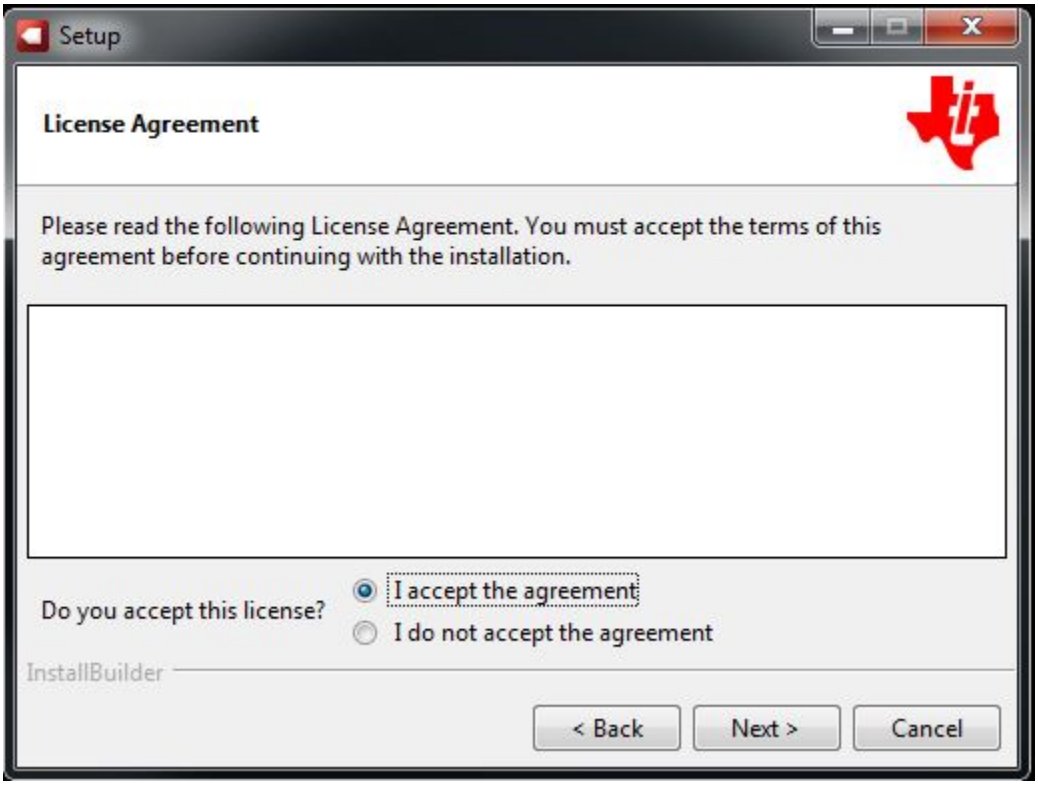

Figure 3. ADS7142 GUI Installation

3. As a part of the ADS7142 GUI installation, a prompt with a *Device Driver Installation Wizard* appears on the screen (see Figure 4). Click the *Next* button to proceed, then click the *Finish* button when the installation is complete.

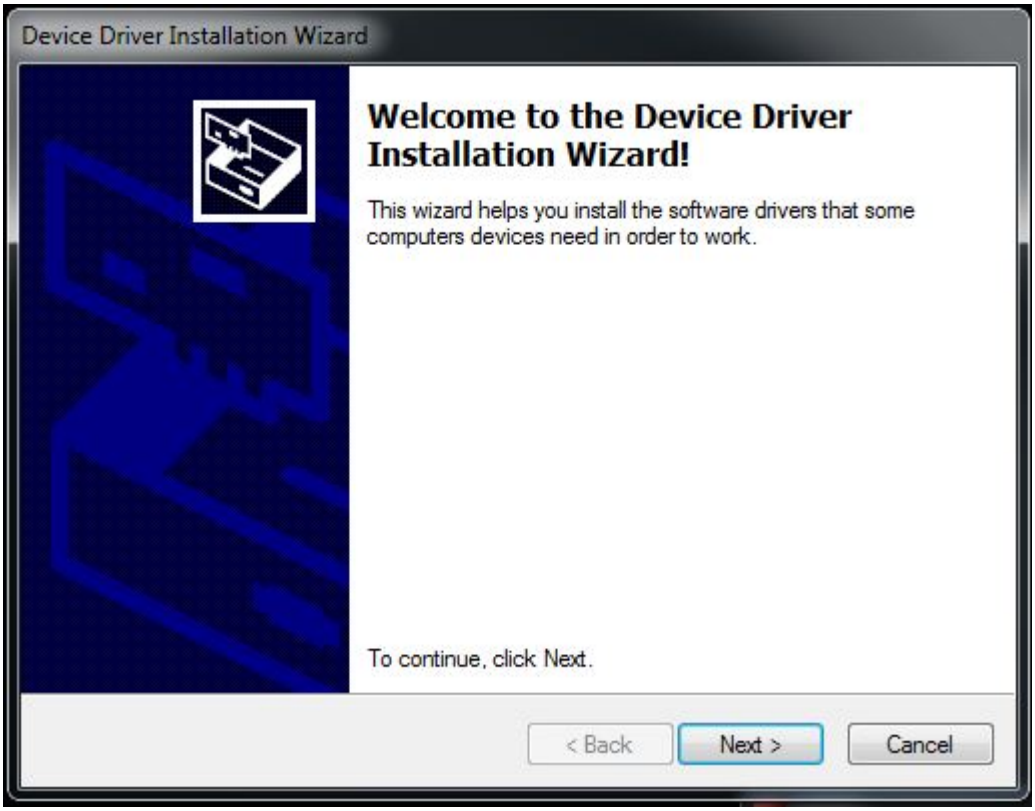

Figure 4. ADS7142 Driver Installation

3.2 LM Flash Programmer for EK-TM4C1294XL Software Programming

The TM4C1294 LaunchPad ships with a default firmware program flashed on its memory. When a LaunchPad is connected to the PC for the first time, its firmware needs to be updated for communications with the BOOSTXL-ADS7142. The following steps describe the programming of this firmware on the flash memory:

1. Download the latest version of *LM Flash Programmer*.
2. Place the JP1 jumper on ICDI from its default position. Connect the EK-TM4C1294XL with the computer through *Debug USB port* marked on LaunchPad.
3. Launch the LM Flash Programmer. In the configuration tab select TM4C1294XL LaunchPad from the drop-down menu.
4. Program the TM4C1294 with the ADS7142 firmware as shown in Figure 5.

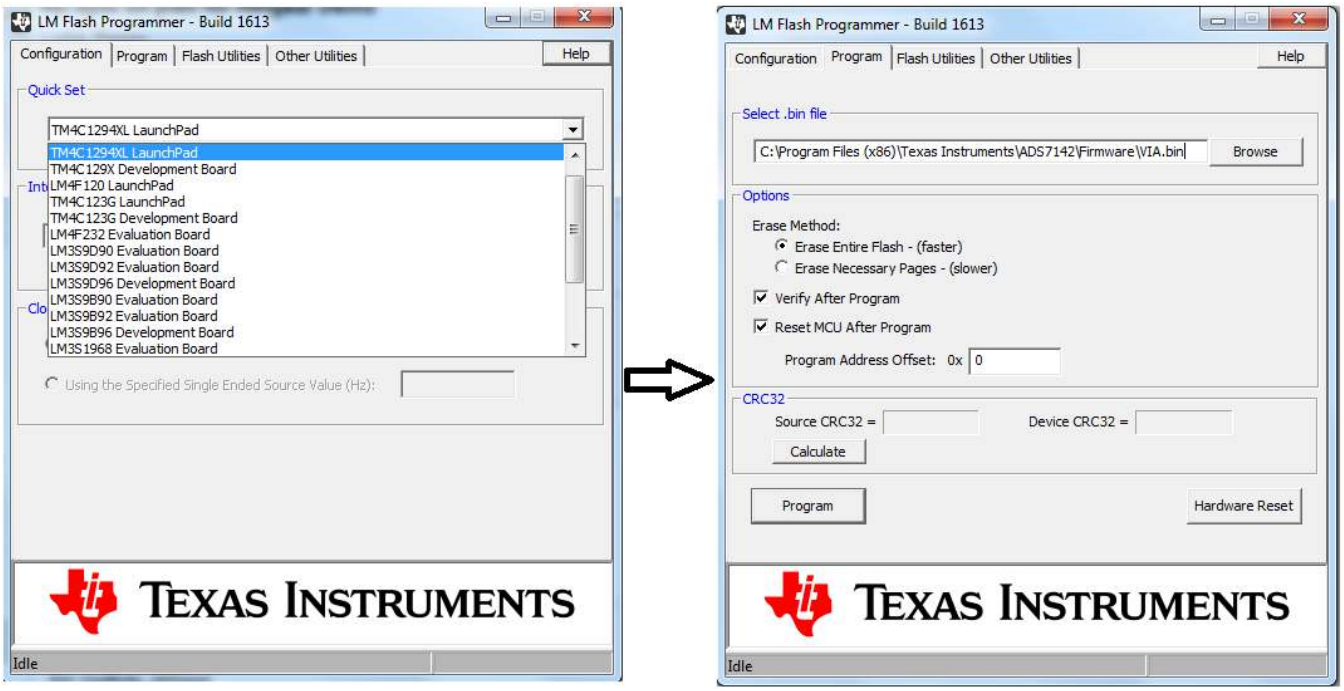

Figure 5. TM4C1294 LaunchPad™ Programming Using LM Flash Programmer

5. After programming and verification is successful, disconnect the USB from the EK-TM4C1294XL debug port. Switch the JP1 jumper position from ICDI to the OTG location.

3.2.1 Setup Instructions

Following are the instructions to set up the BOOSTXL-ADS7142 for evaluation:

1. Stack the BOOSTXL-ADS7142 on the TM4C1294 LaunchPad EK-TM4C1294XL. Make sure the 20-pin connector (J1, J3) on BOOSTXL-ADS7142 is mapped against connector X6 and connector (J4, J2) on BOOSTXL-ADS7142 is mapped against connector X7 on EK-TM4C1294XL. Pin 1 of BOOSTXL-ADS7142 must align with pin 1 of connector X6 on EK-TM4C1294XL.
2. Position the JP1 jumper on pins corresponding to OTG.
3. Connect the micro USB to EK-TM4C1294XL.
4. Figure 6 shows the assembled BOOSTXL-ADS7142 and EK-TM4C1294XL configuration.

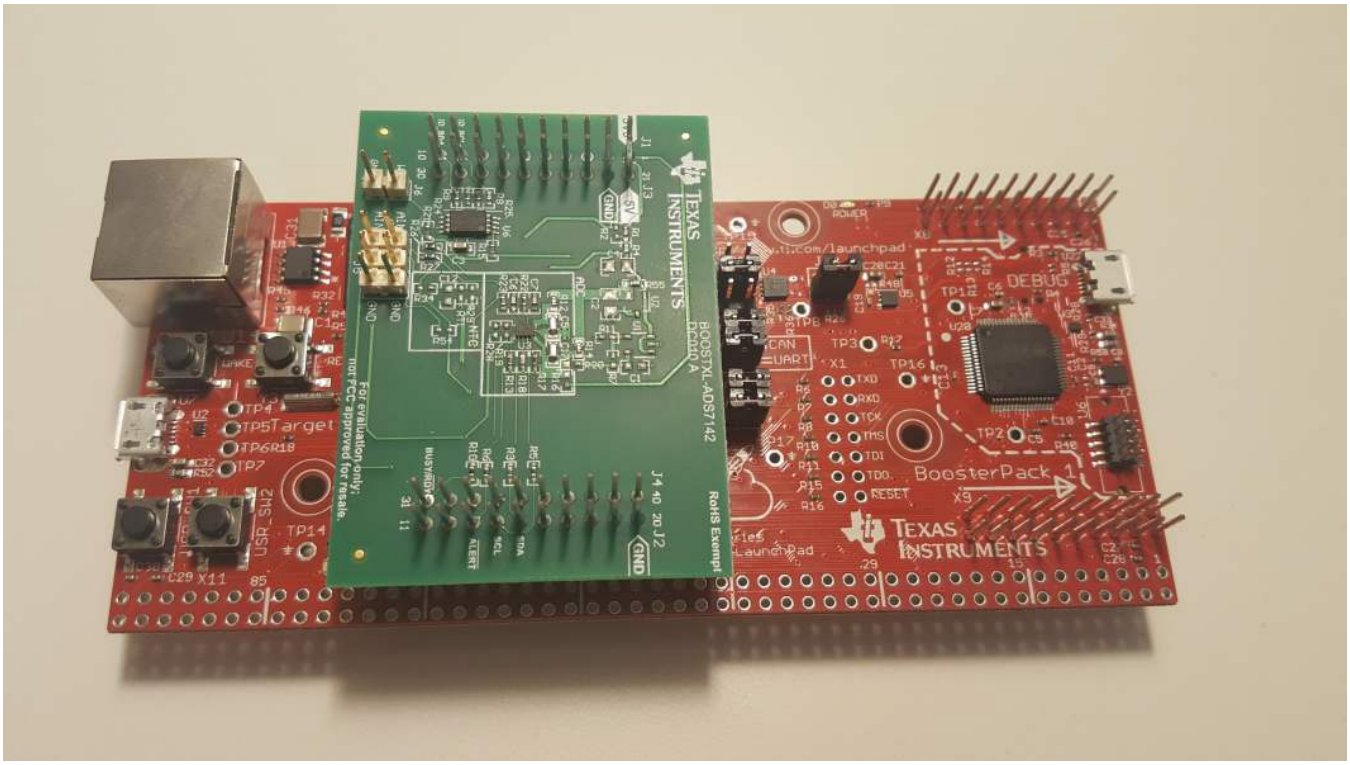

Figure 6. BOOSTXL-ADS7142 Stacked on TM4C1294 LaunchPad™

3.3 ADS7142 GUI Description

3.3.1 Description

Figure 7 shows the landing page of the ADS7142 GUI. This page provides a high-level overview of the ADS7142 device. The left corner shows the tabs required to navigate through the ADS7142 register map and the ADS7142 functional modes page. When the TM4C1294 with the BOOSTXL-ADS7142 stacked is connected to the PC via the micro USB cable, the GUI detects the BoosterPack by reading the onboard EEPROM. Once detected and connected, the GUI indicates this status at the bottom left corner of the GUI.

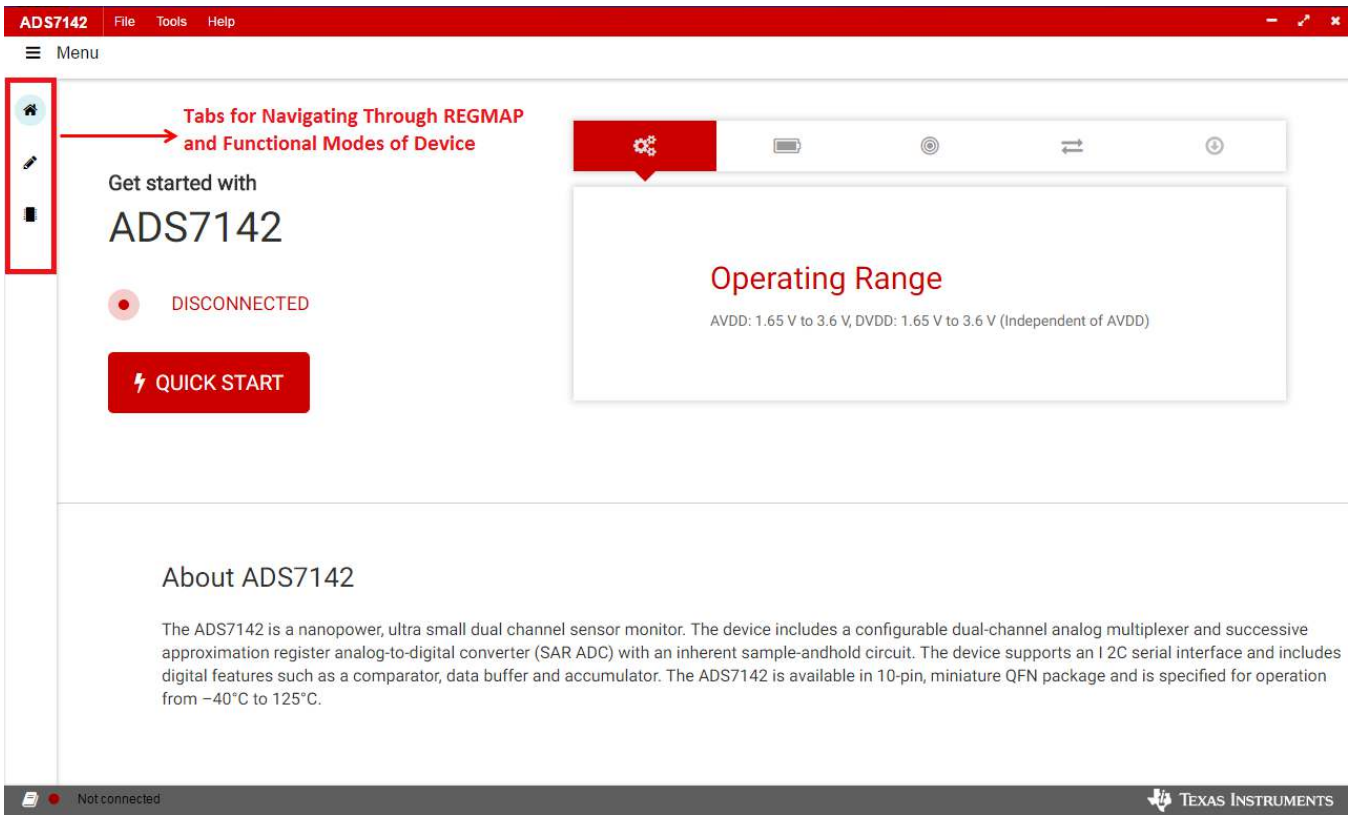

Figure 7. ADS7142 GUI Landing Page

3.3.2 REGMAP

Figure 8 shows register map page for the ADS7142. On the top right corner, options to read registers individually, read all the registers at once, or write individual register are available. Users can choose to have the register values modified in the GUI to be written on the device instantaneously by selecting the *Immediate* option or later using the *Deferred* option.

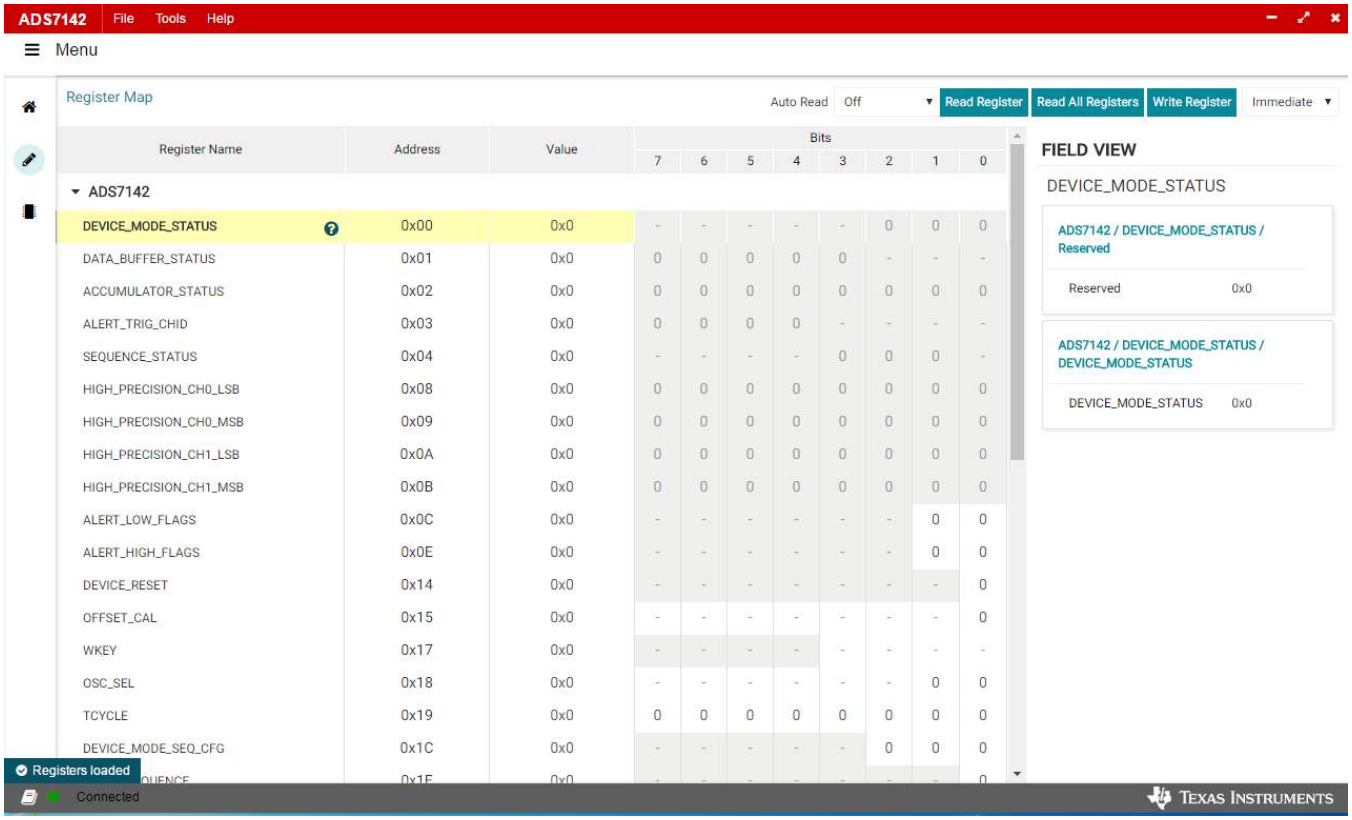

Figure 8. ADS7142 Register Map Page

3.3.3 Functional Mode

Figure 9 shows the functional mode page of the ADS7142 GUI. This page enables the user to navigate and *SET* various functional modes of the device (Autonomous and I^2C command mode) and set channel-specific configurations. On the top right corner is an option to enable all ADC channels and enable alert functionality. TI recommends enabling these blocks and then to enable or disable the preferred ADC channel based on user preference.

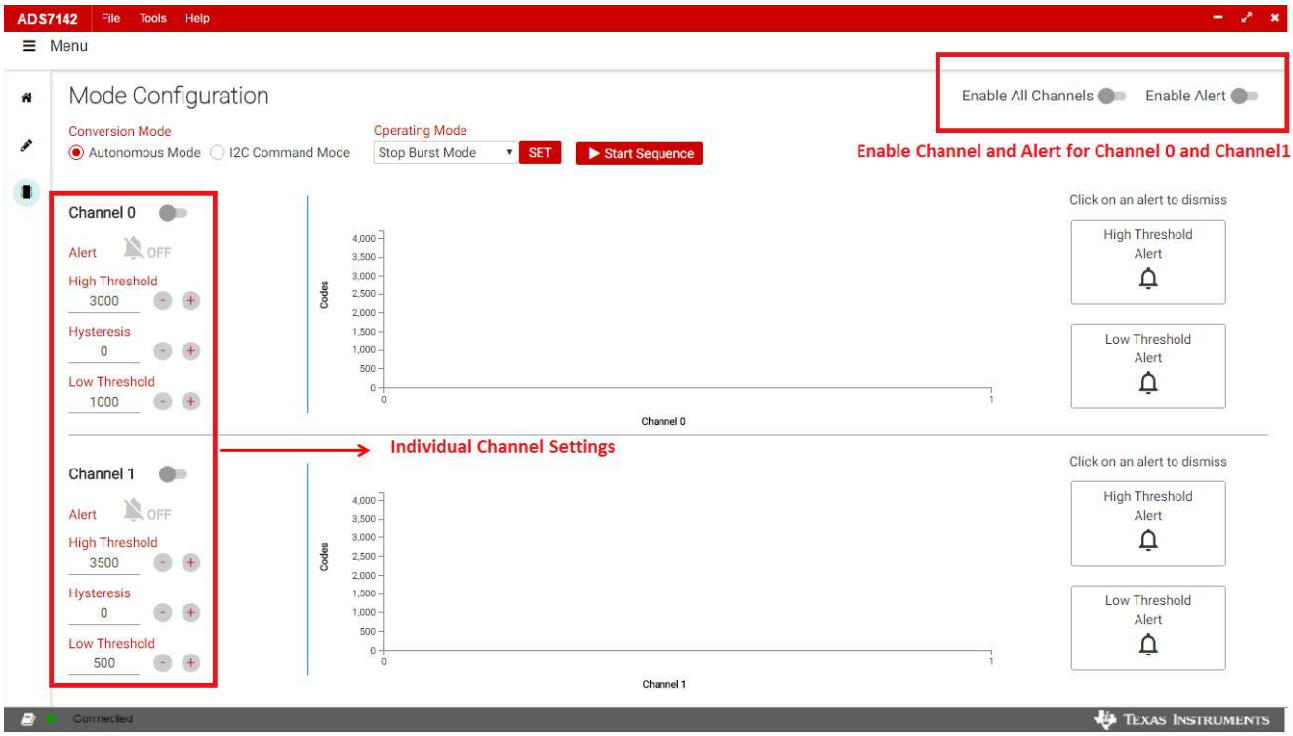

Figure 9. ADS7142 Mode Configuration Page

3.3.4 General Instructions

This section describes the steps involved in selecting functional modes of operation or channel-specific configurations and capturing the data in the selected functional mode:

1. *Enable All Channels* and *Enable Alert* on the top right corner of GUI page.
2. Enter channel-specific configurations such as high and low thresholds, hysteresis, and Alert functionality.
3. Select *Conversion Mode* by clicking on either *Autonomous Mode* or *Manual Mode*.
4. Select the *Operating Mode* from drop-down menu and click *SET* to write register specific to that particular mode.
5. Press *Start Sequence* to capture conversion data from ADS7142.

NOTE: The *Start Sequence* button will remain disabled until the selected *Functional Mode* is *SET* as step 4 indicates.

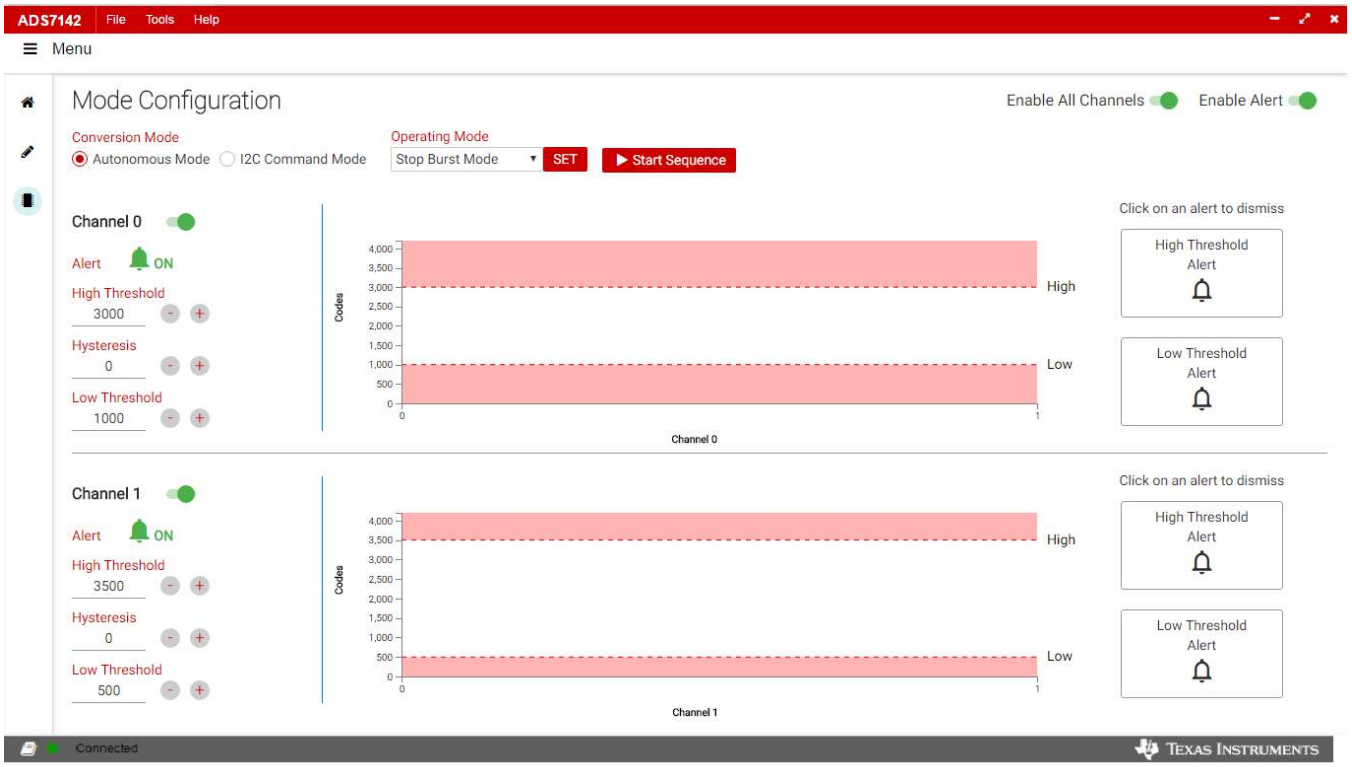

Figure 10. ADS7142 General Instructions Page

4 ADS7142 GUI Functional Modes

The ADS7142 device has the following functional modes:

- **Manual Mode:** In this mode, the host provides I^2C frames to control conversion and read data after each conversion.
- **Autonomous Mode:** The device features an internal data buffer that can store the conversion results of the ADC in *Autonomous Mode* without the host controlling the conversion.
- **High Precision Mode:** In *High Precision Mode*, the results stored in the internal data buffer are accumulated to increase the precision of the conversion results.

The device powers up in *Manual Mode* and can be configured into any of the functional modes by writing the configuration registers for the desired mode.

4.1 Autonomous Mode

In the *Autonomous Conversion Mode*, the device generates the start of conversion pulses using an internal oscillator on receiving the first start of conversion pulse from the host. This can be configured by selecting *Autonomous Mode* as the *Conversion Mode*, selecting one of the *Operating Modes* from the drop-down menu, and pressing the *SET* button. The ADS7142 device then generates the subsequent start of conversion signals autonomously. The *Operating Modes* offered in *Autonomous Mode* are described in the following sections.

4.1.1 Start Burst Mode

When *Start Bust Mode* is selected from the *Operating Modes* drop-down menu and the *SET* button is pressed, the device is configured to store 16 conversion results into the data buffer of the device. The device will stop converting once the data buffer is filled. To understand the steps required to configure the device in this mode, refer to the ADS7142 data sheet (SBAS773).

Figure 11 highlights the ADS7142 GUI working in *Start Burst Mode*.

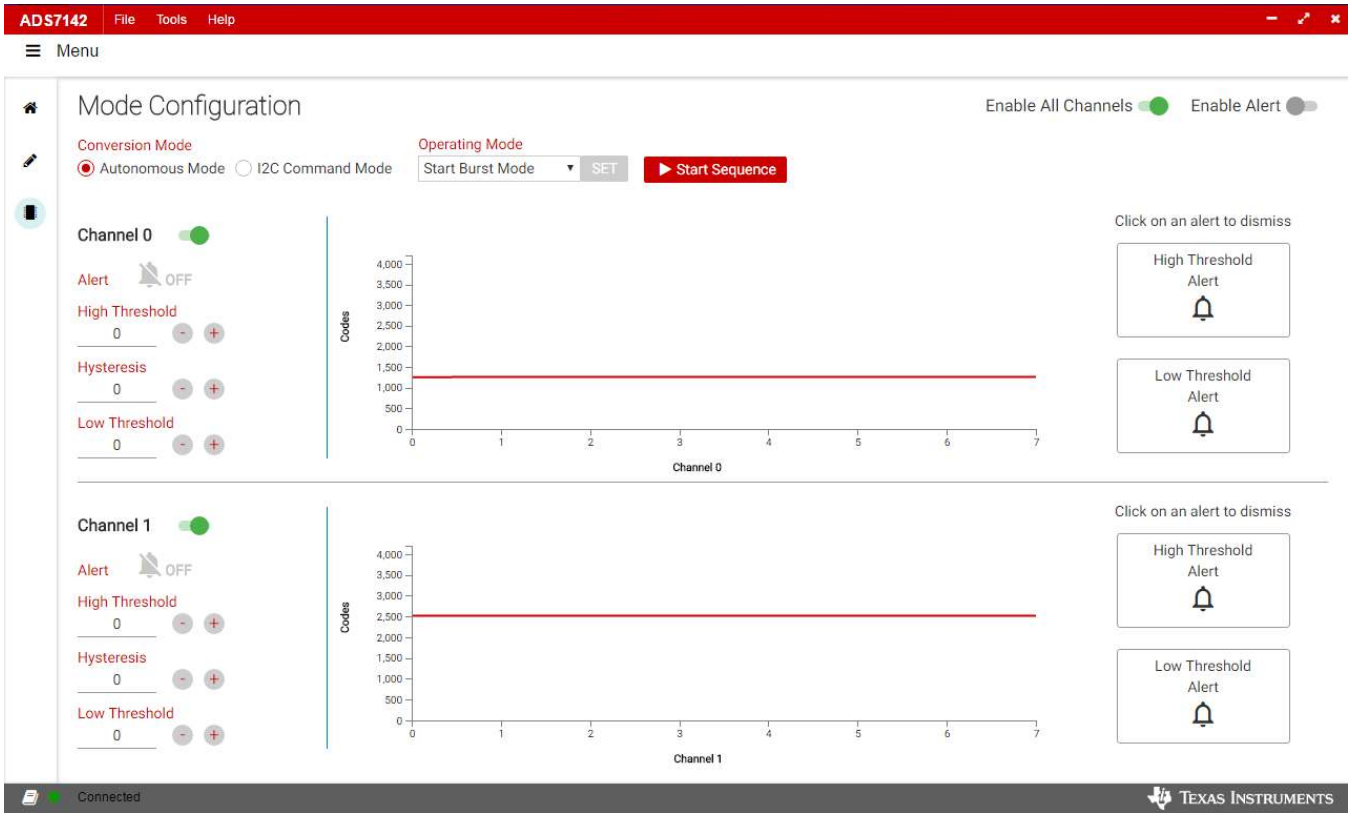

Figure 11. Data Capture in Start Burst Mode

4.1.2 Stop Burst Mode

When *Stop Bust Mode* is selected from the *Operating Modes* drop-down menu and the *SET* button is pressed, the device will keep on sampling input signals and storing the conversion results in the data buffer unless the user initiates the command to abort the sequence by pressing the *Abort Sequence* button in the GUI and stops filling the data buffer. To understand the steps required to configure the device in this mode, refer to the ADS7142 data sheet.

Figure 12 highlights the ADS7142 GUI working in *Stop Burst Mode*.

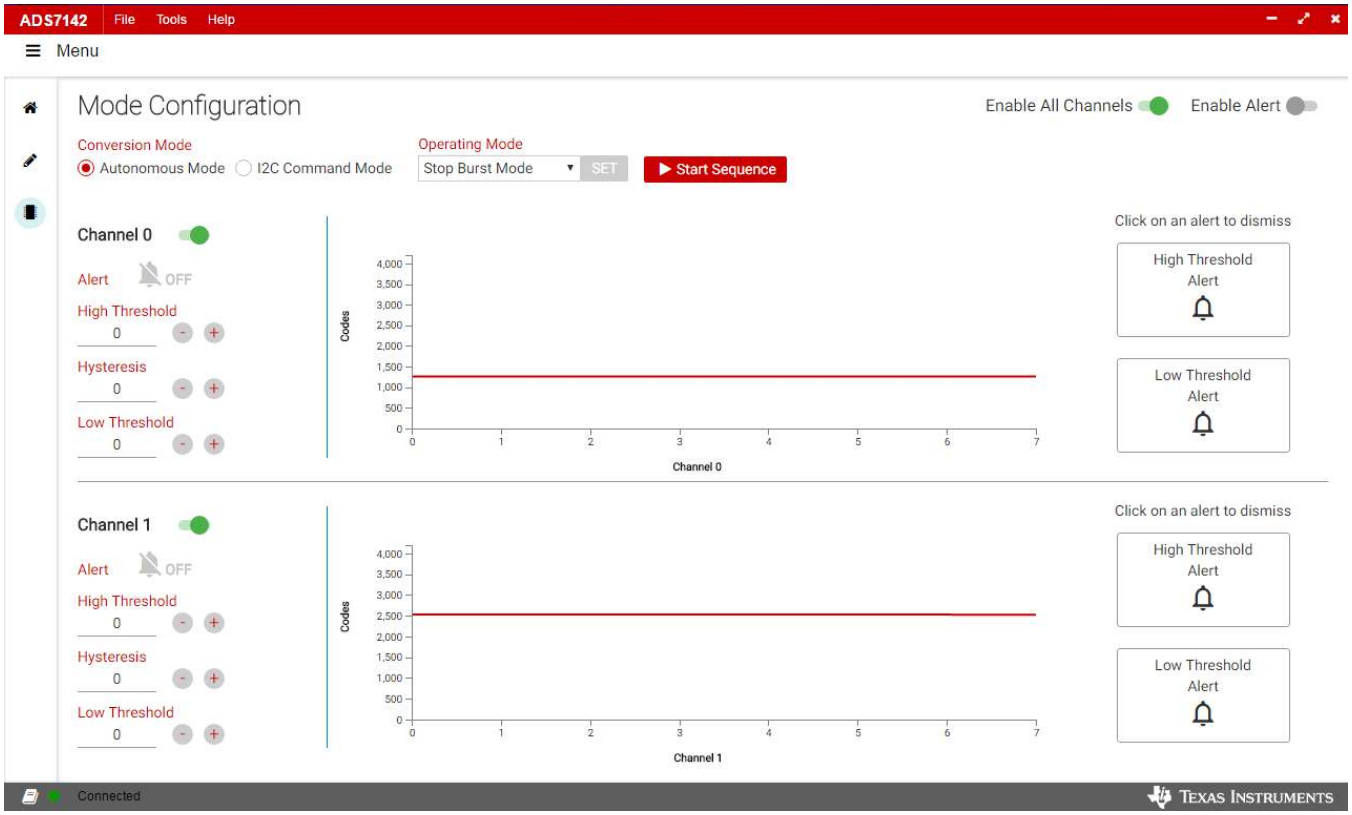

Figure 12. Data Capture in Stop Burst Mode

4.1.3 Pre Alert Mode

When *Pre Alert Mode* is selected from the *Operating Modes* drop-down menu and the *SET* button is pressed, the device starts conversions and stores the data in the data buffer until the input signal crosses either the high or low threshold for the channels selected in the sequence. If the user aborts the sequence before the data buffer is filled, the device will abort the sequence and stop storing the conversion results. To understand the steps required to configure the device in this mode, refer to the ADS7142 data sheet.

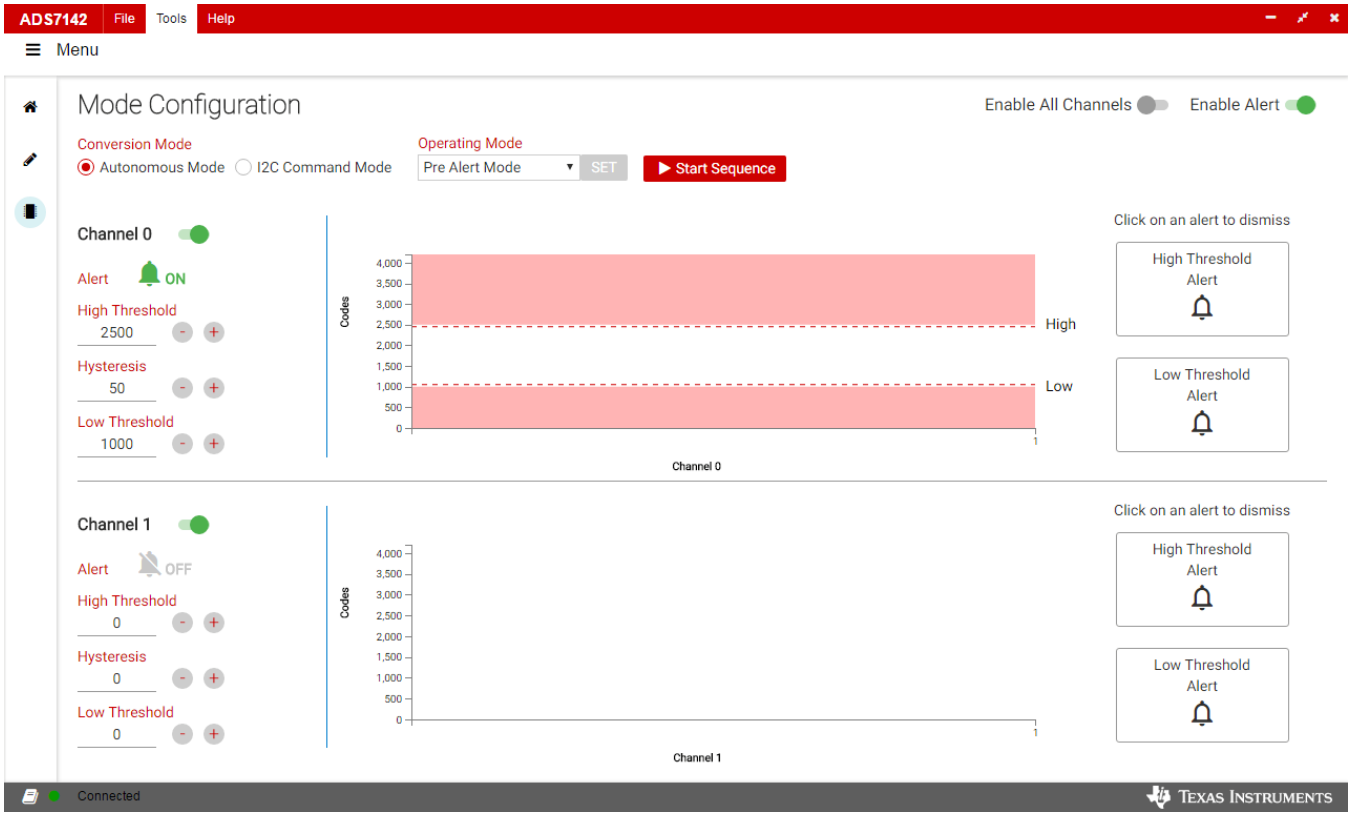

Figure 13. Operation in Pre Alert Mode

Figure 13 shows the ADS7142 GUI configured in *Pre Alert Mode* with the Alert functionality enabled on Channel 0. In this example, the *High Threshold*, *Hysteresis*, and *Low Threshold* are set. The thresholds are marked on the graph in pink and hysteresis is indicated by the dotted line.

Figure 14 shows the GUI after an Alert condition is encountered. In this example, Channel 0 has reached the *High Threshold*. This is indicated by the *High Threshold* indicator on the right side of the corresponding graph. Since the device is configured for *Pre Alert Mode* operation with both channels enabled, the conditions prior to reaching the *Alert* condition are displayed. The *Alert* condition must be cleared, by clicking on the *Threshold* indicator before the next sequence is run to ensure normal operation of the device.

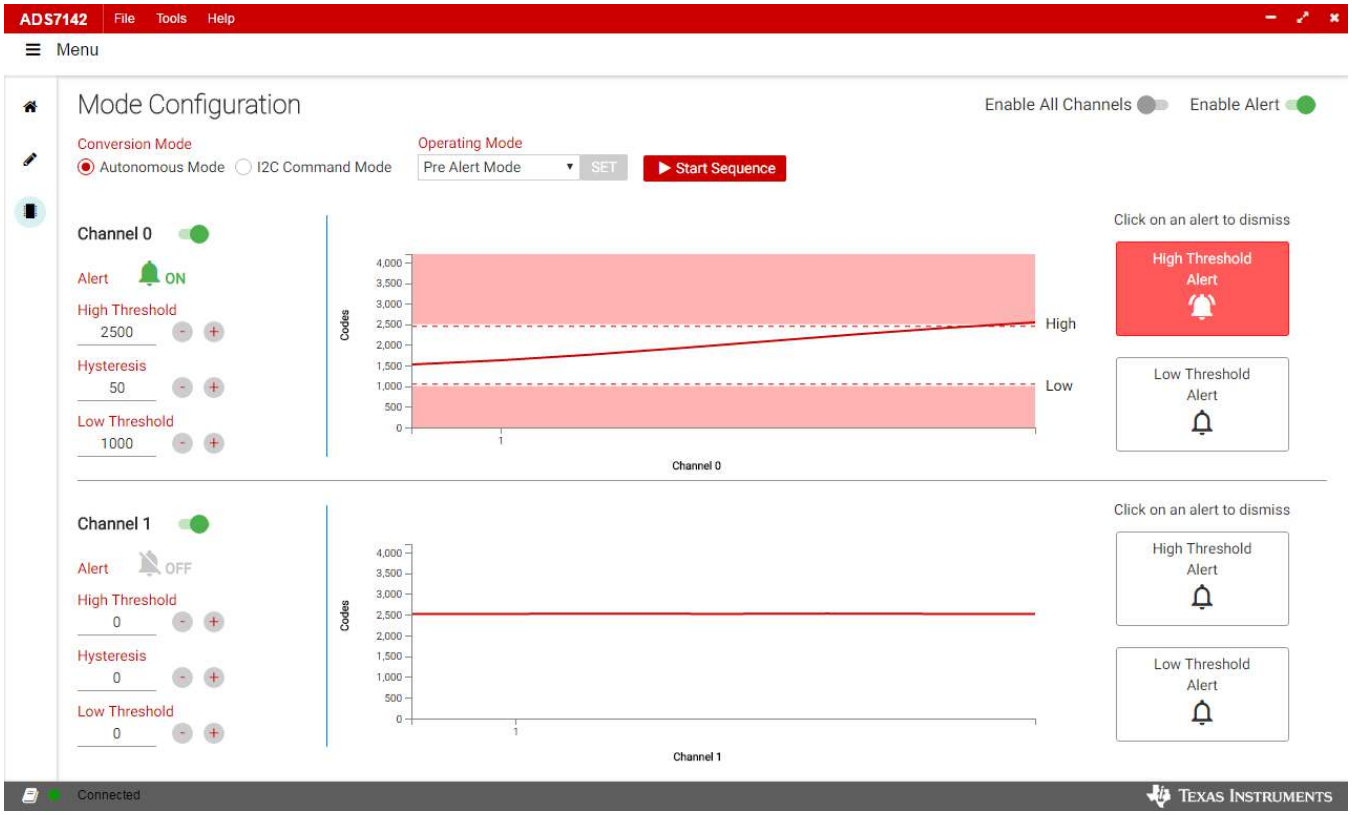

Figure 14. Operation After Alert Condition

4.1.4 Post Alert Mode

When the device is configured in *Post Alert Mode* operation, the device starts converting the input signal and storing the data in the data buffer only after it reaches one of the *Alert* thresholds set for the channels selected in the sequence. If the user aborts the sequence before the data buffer is filled, the device stops storing the conversion results. To understand the steps required to configure the device in this mode, refer to the ADS7142 data sheet.

Figure 15 highlights the ADS7142 GUI working in *Post Alert Mode*. Once either of the low or high thresholds is reached, make sure to read the *Alert* by clicking on the highlighted *Alert* block in *red* before running the next sequence.

Figure 15. Operation in Post Alert Mode

4.2 High Precision Mode

The *High Precision Mode* increases the accuracy of the data measurement to 16-bit accuracy. This is useful for applications where the level of precision required to accurately measure the sensor output needs to be higher than 12-bits. When *High Precision Mode* is selected from the *Operating Modes* drop-down menu and the *SET* button is pressed, the device starts conversions and starts accumulating the conversion results in an accumulator. The device stops accumulating the conversion results in the accumulator after 16 conversions. If the user aborts the sequence before 16 conversions, then the device will abort the sequence. To understand the steps required to configure the device in this mode, refer to the ADS7142 data sheet.

Figure 16 highlights the ADS7142 GUI working in *High Precision Mode*. The maximum number of accumulator count that can be entered into the ACCUMULATOR_CFG register is 15 (0x0F) which corresponds to 16 conversions.

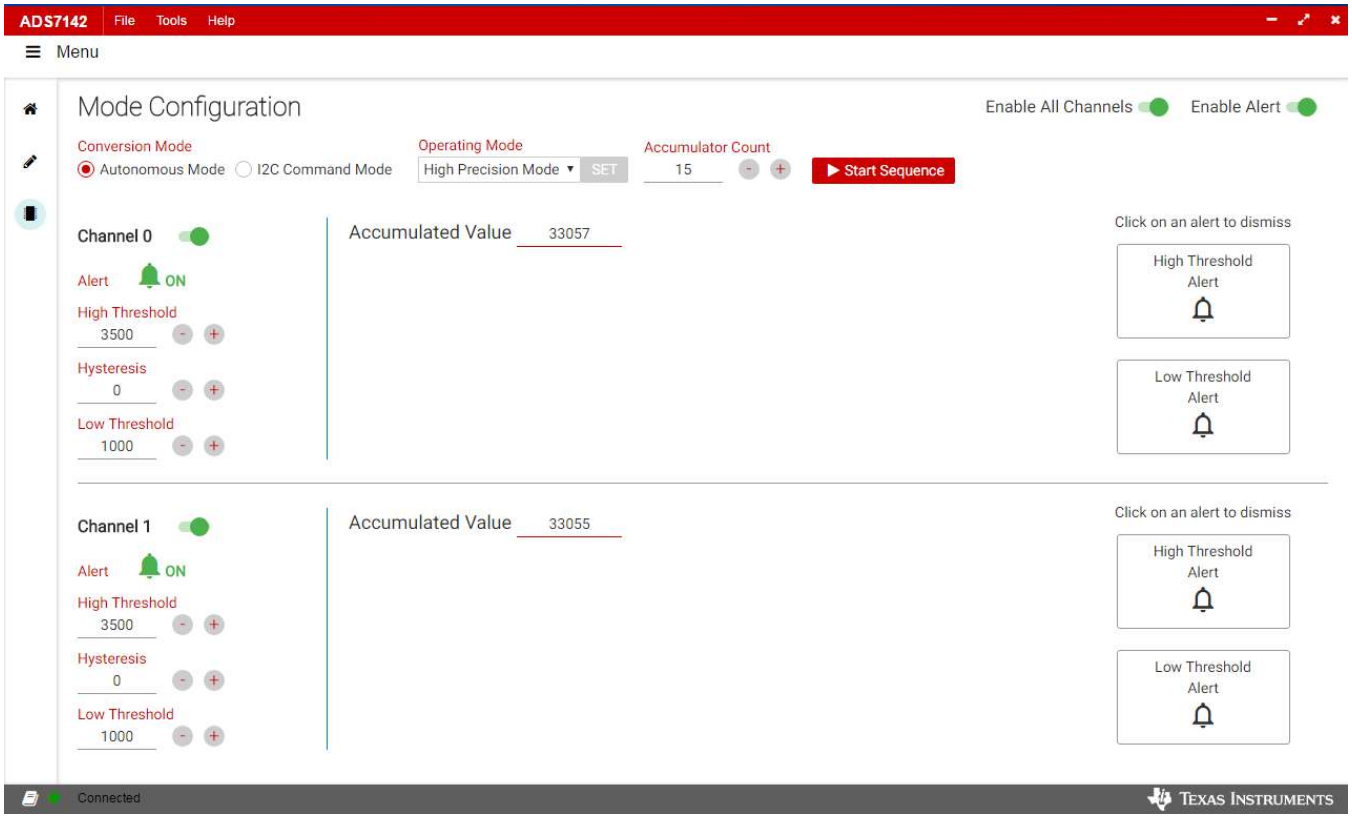

Figure 16. Operation in High Precision Mode

4.3 Manual Mode

Manual Mode allows the external host processor to directly request and control when the data is sampled. The data capture is initiated by an I^2C command from the host processor and the captured data is then returned over the I^2C bus. *Manual Mode* can work one of the following states based on power up or user-initiated conditions.

4.3.1 Default Mode

On power up, the device is in *Manual Mode* with single-ended and dual-channel configuration and it samples the analog input applied on Channel 0 (AIN0-GND) . In this mode, the device uses high-frequency oscillator for conversions. Figure 17 highlights the ADS7142 GUI working in *Manual Mode*: *Default State*.

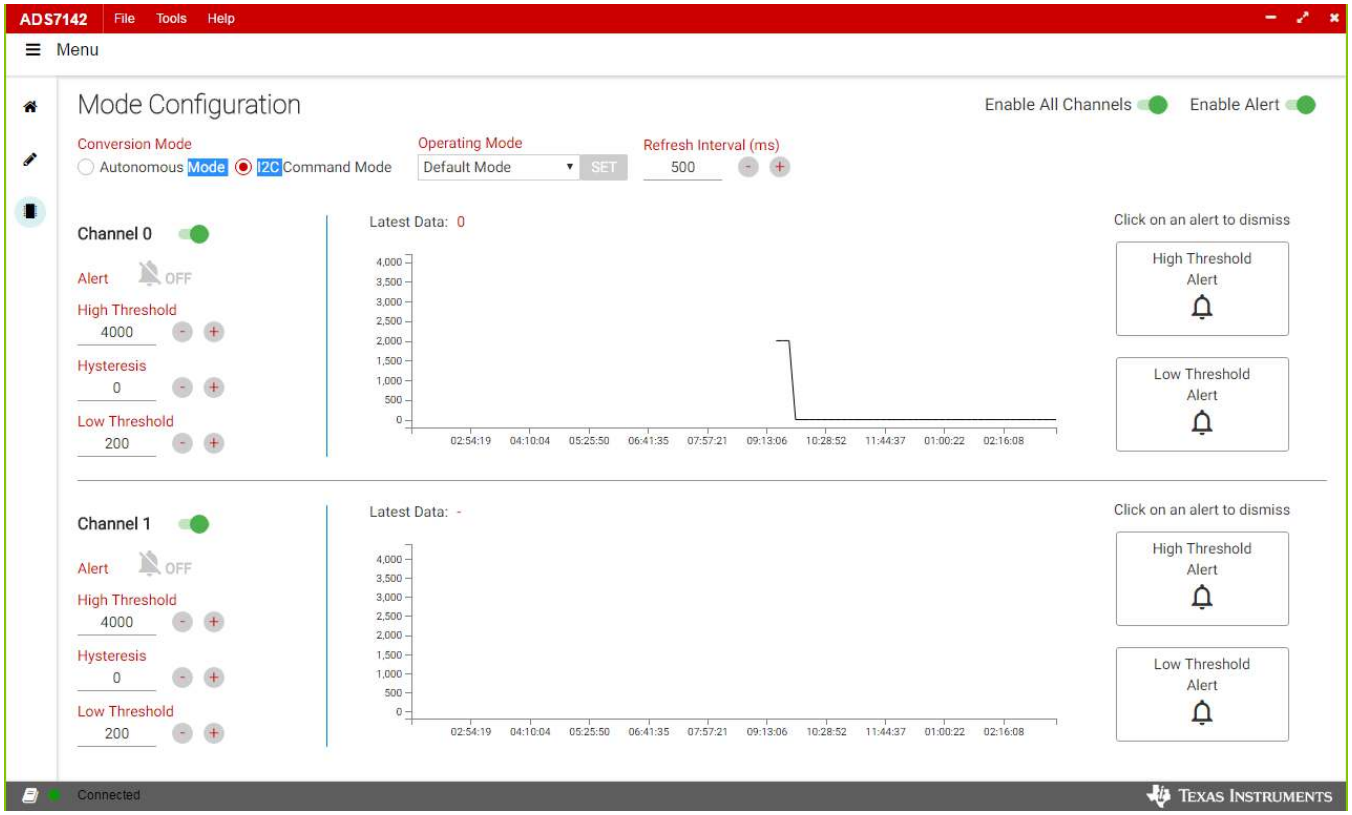

Figure 17. Operation in Default Manual Mode

4.3.2 Auto Mode

The host can either configure the device to scan through one channel or both channels by configuring the CHANNEL_IP_CFG register and AUTO_SEQ register. The host has to provide continuous clock (SCL) to the device to scan through the channels and read the data from the device. Figure 18 highlights the ADS7142 GUI working in *Manual Mode*: *Default State*.

To understand the steps required to configure the device in *Manual Mode*, refer to the ADS7142 data sheet.

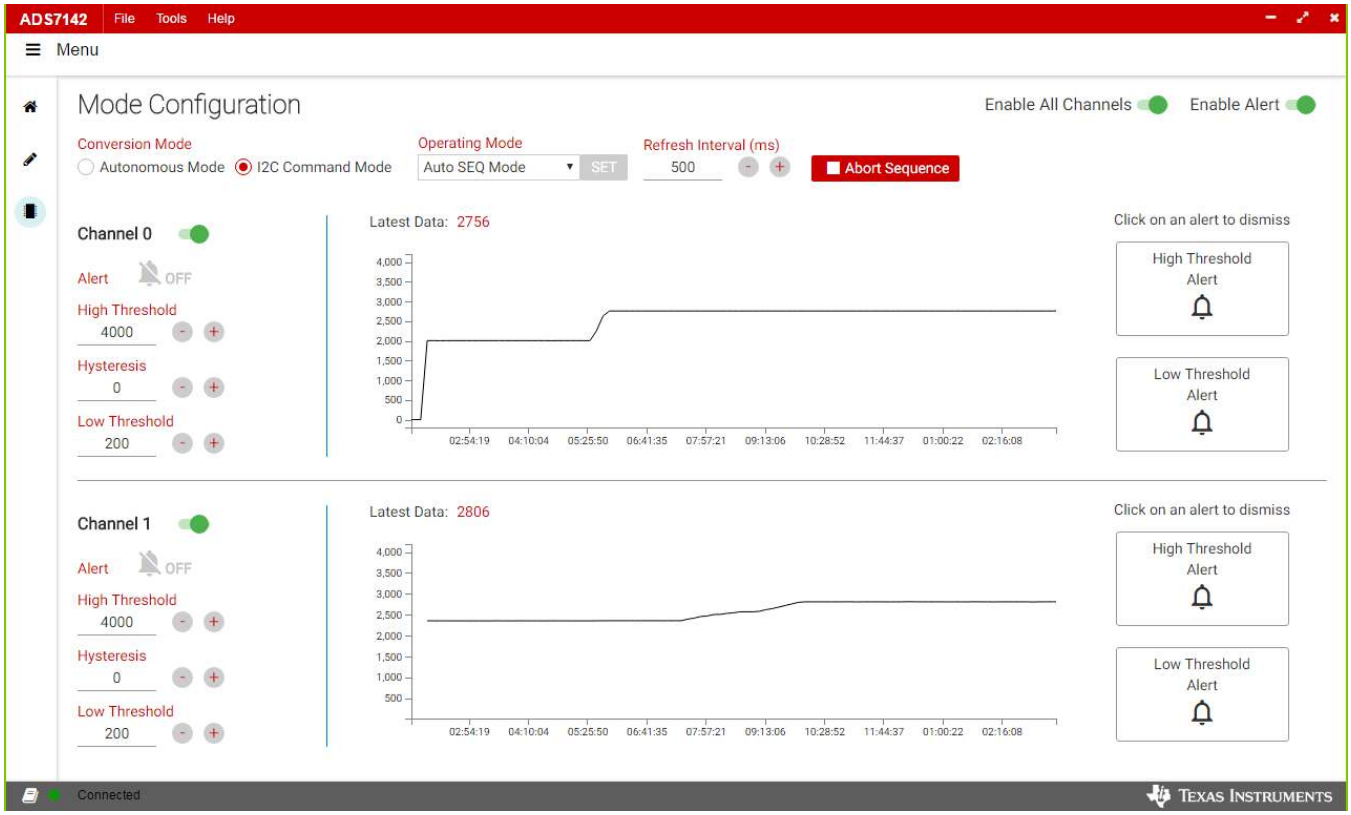

Figure 18. Operation in Auto Manual Mode

4.4 Temperature Monitoring Using BOOSTXL-ADS7142

The BOOSTXL-ADS7142 has a provision for an onboard NTC-based temperature monitoring circuit. By default, the NTC monitoring section is not populated. The NTC-based temperature monitoring can be enabled on CH0. In order to enable temperature monitoring, make the changes to the evaluation board as shown in Table 2.

Table 2. Modification Required for NTC Monitoring

Components	EVM Default Status	Modification Required for NTC Monitoring
R26	Assemble	Do Not Populate
R29, R34, RT1, C12	Do Not Populate	Assemble

4.5 Input Signal Conditioning Block on BOOSTXL-ADS7142

For applications where the input signal requires additional conditioning before being interfaced to the ADC, the BOOSTXL-ADS7142 has an optional signal conditioning path that can be populated between the input signal and the ADS7142. The board has a provision to introduce a dual-channel operational amplifier (U4) which can be configured in either a non-inverting buffer or inverting gain configuration based on the signal conditioning requirement. By default, this signal conditioning block is not populated on the evaluation board. In order to use this block, populate the operational amplifier U4 and the associated biasing components based on the required op-amp configuration (non-inverting buffer or inverting configuration). Refer to Section 5.3 for more details.

5 Bill of Materials, Printed-Circuit Board Layout, and Schematics

This section contains the BOOSTXL-ADS7142 bill of materials (BOM), printed-circuit board (PCB) layout, and schematics.

5.1 Bill of Materials

Table 3 lists the bill of materials (BOM) for the PGA460-Q1 EVM.

Table 3. Bill of Materials

Designator	Quantity	Description	Manufacturer Part Number	Manufacturer
BOOSTXL-ADS7886	1	Printed Circuit Board	DC010	Any
C5, C17	2	CAP, CERM, 1uF, 16V, ±10%, X7R, 0603	C1608X7R1C105K	TDK
C6, C7	2	CAP, CERM, 470 pF, 50 V, ±10%, X7R, AEC-Q200 Grade 1, 0402	CGA2B2X7R1H471K050BA	TDK
C19	1	CAP, CERM, 0.1 µF, 16 V, ±10%, X7R, 0603	GRM188R71C104KA01D	Murata
FID1, FID2, FID3, FID4, FID5, FID6	6	Fiducial mark. There is nothing to buy or mount.	N/A	N/A
J1	1	Header, 100mil, 3x2, Gold, TH	TSW-103-07-G-D	Samtec
J1/J3, J2/J4	2	Receptacle, 2.54mm, 10x2, Tin, TH	SSQ-110-03-T-D	Samtec
J7	1	Header, 100mil, 2x1, Tin, TH	PEC02SAAN	Sullins Connector Solutions
LBL1	1	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	THT-14-423-10	Brady
R1, R3, R5, R6, R8, R9, R10, R12, R14, R26, R27, R55	11	RES, 0, 5%, 0.063 W, 0402	RC0402JR-070RL	Yageo America
R4	1	RES, 10.0, 0.1%, 0.063 W, 0402	CPF0402B10RE1	TE Connectivity
R13, R17, R18, R24, R25	5	RES, 1.00 k, 1%, 0.063 W, 0402	MCR01MZPF1001	Rohm
R15, R21	2	RES, 10.0k ohm, 1%, 0.063W, 0402	CRCW040210K0FKED	Vishay-Dale
R22, R23	2	RES, 100, 5%, 0.063 W, 0402	CRCW0402100RJNED	Vishay-Dale
U3	1	Ultra-Low Power, Ultra-Small Size, 12-Bit, SAR ADC with Intelligent Digital Features, RUG0010A (X2QFN-10)	ADS7142IRUGR	Texas Instruments
U7	1	I^2C BUS EEPROM (2-Wire), TSSOP-B8	BR24G32FVT-3AGE2	Rohm
C1	0	CAP, CERM, 1 µF, 25 V, ±10%, X7R, 0603	C0603C105K3RACTU	Kemet
C2	0	CAP, CERM, 3.3 µF, 10 V, ±10%, X5R, 0805	C0805C335K8PACTU	Kemet
C4	0	CAP, CERM, 10 µF, 16 V, ±20%, X5R, 0805	0805YD106MAT2A	AVX
C8, C9, C13, C14	0	CAP, CERM, 0.01 µF, 10 V, ±10%, X7R, 0603	0603ZC103KAT2A	AVX
C10, C11	0	CAP, CERM, 0.1 µF, 16 V, ±10%, X7R, 0603	GRM188R71C104KA01D	Murata
C12	0	CAP, CERM, 1uF, 16V, ±10%, X7R, 0603	C1608X7R1C105K	TDK
C15, C16	0	CAP, CERM, 1000 pF, 50 V, ±5%, C0G/NP0, 0603	C0603C102J5GAC	Kemet
R2, R16, R20, R32, R33, R34, R37, R38, R39, R40, R43, R44, R49, R50, R54	0	RES, 0, 5%, 0.063 W, 0402	RC0402JR-070RL	Yageo America
R7	0	RES, 487 k, 1%, 0.063 W, 0402	CRCW0402487KFKED	Vishay-Dale
R11, R41, R42	0	RES, 1.0 M, 5%, 0.063 W, 0402	CRCW04021M00JNED	Vishay-Dale

Table 3. Bill of Materials (continued)

Designator	Quantity	Description	Manufacturer Part Number	Manufacturer
R19, R28	0	RES, 1.00 k, 1%, 0.063 W, 0402	MCR01MZPF1001	Rohm
R29, R51, R53	0	RES, 10 k, 5%, 0.063 W, 0402	CRCW040210K0JNED	Vishay-Dale
R30, R31	0	RES, 100 k, 5%, 0.063 W, 0402	CRCW0402100KJNED	Vishay-Dale
R35, R36	0	RES, 1.0 k, 5%, 0.063 W, 0402	CRCW04021K00JNED	Vishay-Dale
R45, R46, R52	0	RES, 0, 5%, 0.1 W, 0603	CRCW06030000Z0EA	Vishay-Dale
R47, R48	0	RES, 330 k, 5%, 0.063 W, 0402	CRCW0402330KJNED	Vishay-Dale
RT1	0	Thermistor NTC, 10k ohm, 5%, 0402	NCP15XH103J03RC	Murata
U1	0	Single Output LDO, 150 mA, Adjustable 1.22 to 5.25 V Output, 2.2 to 5.5 V Input, with 500 nA Quiescent Current, 5-pin SOT (DDC), -40 to 125 degC, Green (RoHS & no Sb/Br)	TPS78001DDCR	Texas Instruments
U2	0	30 ppm / degC Drift, 3.9 uA Voltage Reference, -40 to 125 degC, 3-pin SOT-23 (DBZ), Green (RoHS & no Sb/Br)	REF3330AIDBZRG4	Texas Instruments
U4	0	Dual-Channel 425nA Precision Nanopower Operational Amplifiers, DGK0008A (VSSOP-8)	LPV812DGKR	Texas Instruments
U5	0	Micro-Power (50mA), Zerø-Drift, Rail-to-Rail Out Instrumentation Amplifier (VSSOP-8)	INA333AIDGKR	Texas Instruments

5.2 PCB Layout

Figure 19 and Figure 20 show the EVM PCB layout.

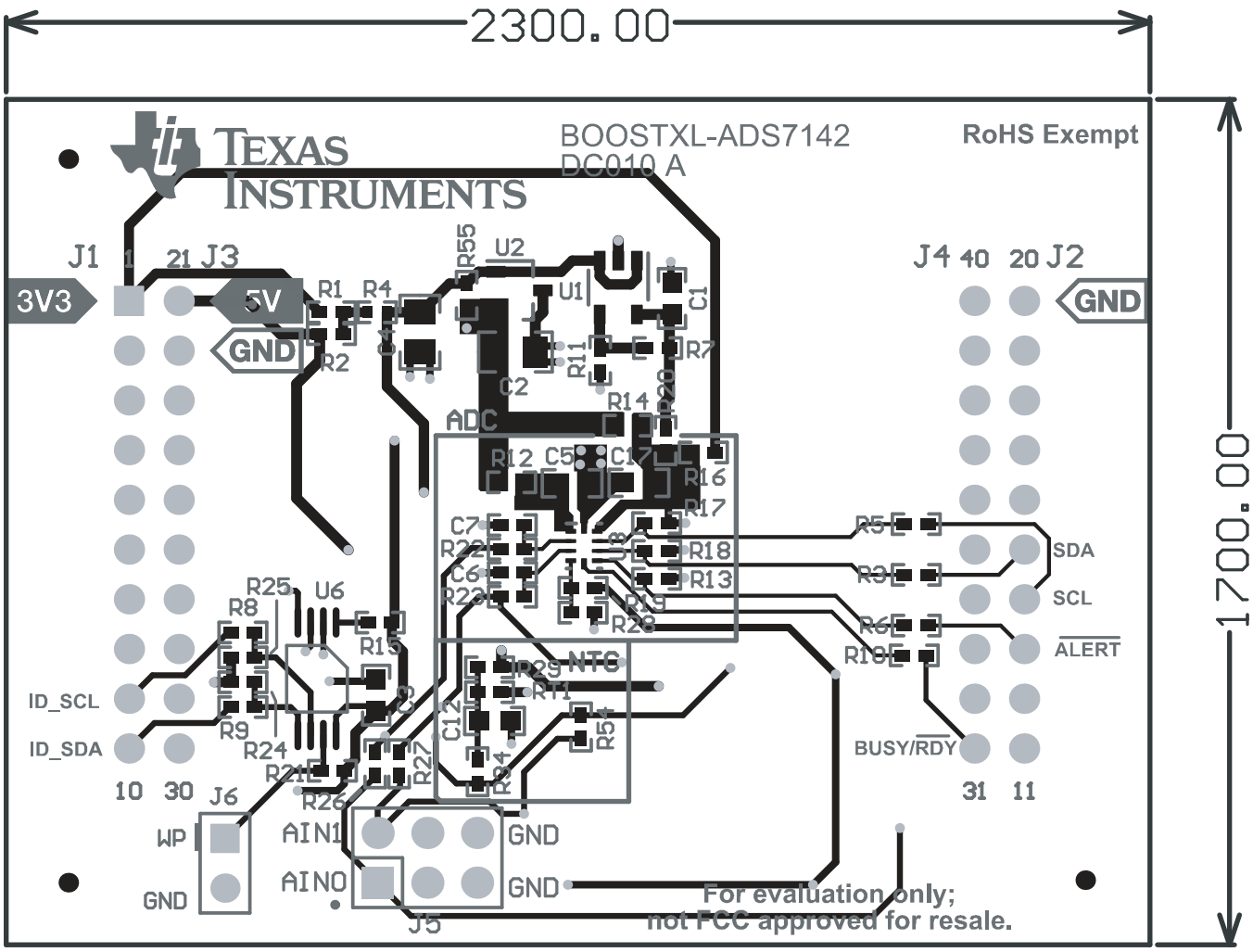

Figure 19. BOOSTXL-ADS7142 Top Layer Copper and Silkscreen

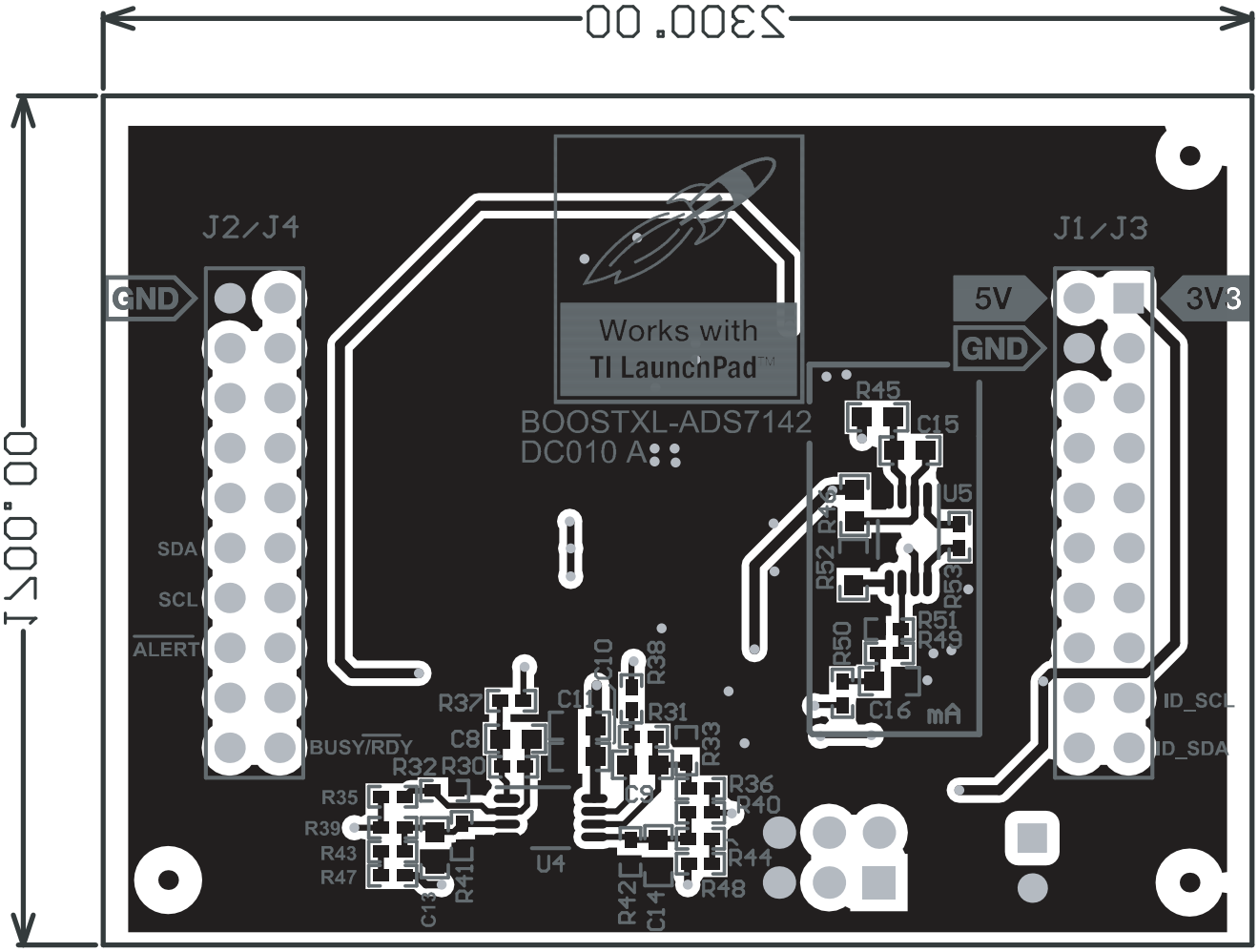

Figure 20. BOOSTXL-ADS7142 Bottom Layer Copper and Silkscreen

5.3 Schematics

Figure 21 and illustrate the ADS7142 BoosterPack schematics.

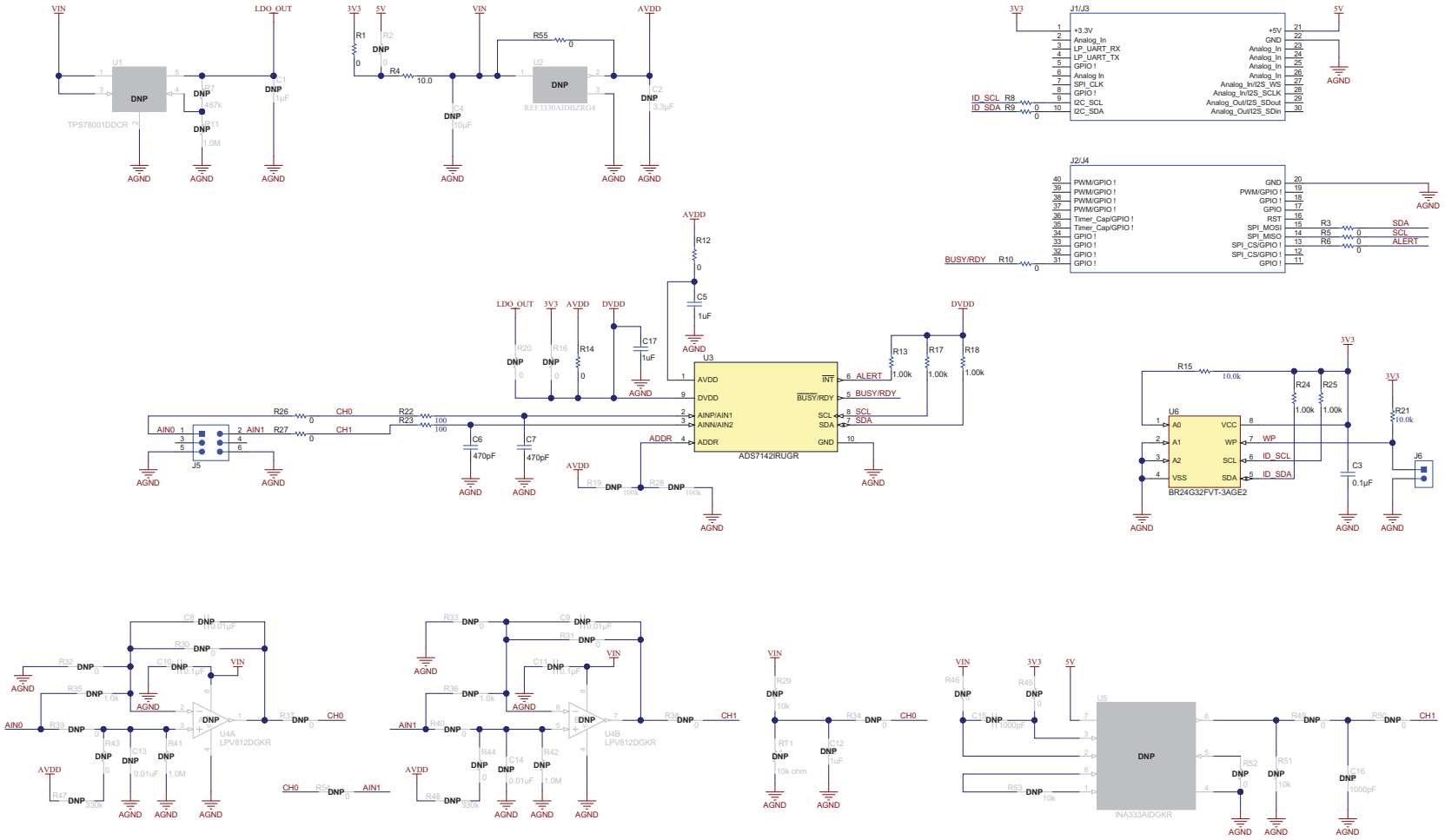

Figure 21. ADS7142 BoosterPack™ Schematic Diagram

Revision History

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

Changes from A Revision (December 2017) to B Revision **Page**

- Deleted previous Figure 19, *Layer 1: Top Overlay*, as redundant 24
- Changed new Figure 19, *Top Layer Copper and Silkscreen*, for clarity 24
- Deleted previous Figure 22, *Layer 4: Bottom Overlay*, as redundant 25
- Changed new Figure 20, *Bottom Layer Copper and Silkscreen*, for clarity 25
- Changed Figure 21, *Schematic Diagram*, for clarity 26
- Deleted Figure 24, *Schematic Diagram (Page 2)*, as redundant 26

Changes from Original (August 2017) to A Revision **Page**

- Changed *BOOSTXL-ADS7142 Stacked on TM4C1294 LaunchPad™* image. 8
- Changed *I2C Command Mode* to *Manual Mode* throughout user's guide. 12
- Added *Temperature Monitoring Using BOOSTXL-ADS7142* section. 21
- Added *Input Signal Conditioning Block on BOOSTXL-ADS7142* section. 21

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      CAUTION

      This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

      Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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      NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

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- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

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(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

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1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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