

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.

Contents

1	Introduction	2
2	BOOSTXL-ADS7142 EVM Overview	3
3	BOOSTXL-ADS7142 EVM Initial Setup	5
4	ADS7142 GUI Functional Modes	13
5	Bill of Materials, Printed-Circuit Board Layout, and Schematics	22

List of Figures

1	ADS7142 EVM Block Diagram.....	2
2	BOOSTXL-ADS7142 Top Level Overview	3
3	ADS7142 GUI Installation	5
4	ADS7142 Driver Installation	6
5	TM4C1294 LaunchPad™ Programming Using LM Flash Programmer	7
6	BOOSTXL-ADS7142 Stacked on TM4C1294 LaunchPad™	8
7	ADS7142 GUI Landing Page.....	9
8	ADS7142 Register Map Page	10
9	ADS7142 Mode Configuration Page.....	11
10	ADS7142 General Instructions Page	12
11	Data Capture in Start Burst Mode	13
12	Data Capture in Stop Burst Mode.....	14
13	Operation in Pre Alert Mode	15
14	Operation After Alert Condition.....	16
15	Operation in Post Alert Mode	17
16	Operation in High Precision Mode	18
17	Operation in Default Manual Mode	19
18	Operation in Auto Manual Mode	20
19	BOOSTXL-ADS7142 Top Layer Copper and Silkscreen	24
20	BOOSTXL-ADS7142 Bottom Layer Copper and Silkscreen	25
21	ADS7142 BoosterPack™ Schematic Diagram	26

List of Tables

1	Input Connector and Channel Configuration	3
2	Modification Required for NTC Monitoring	21
3	Bill of Materials	22

BoosterPack, LaunchPad are trademarks of Texas Instruments.
All other trademarks are the property of their respective owners.

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 I²C interface.

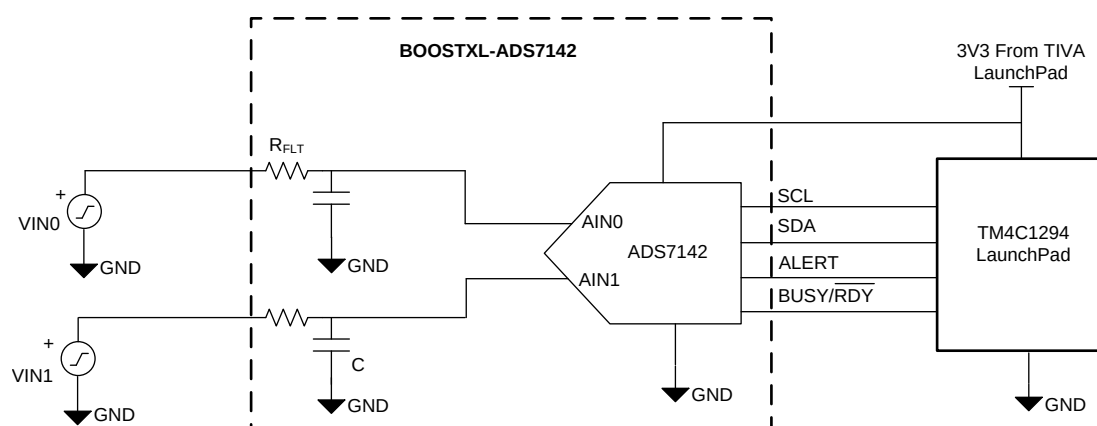
NOTE: The BOOSTXL-ADS7142 requires an external master controller to evaluate the ADS7142.

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 I²C 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
- I²C 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.



Copyright © 2017, Texas Instruments Incorporated

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.

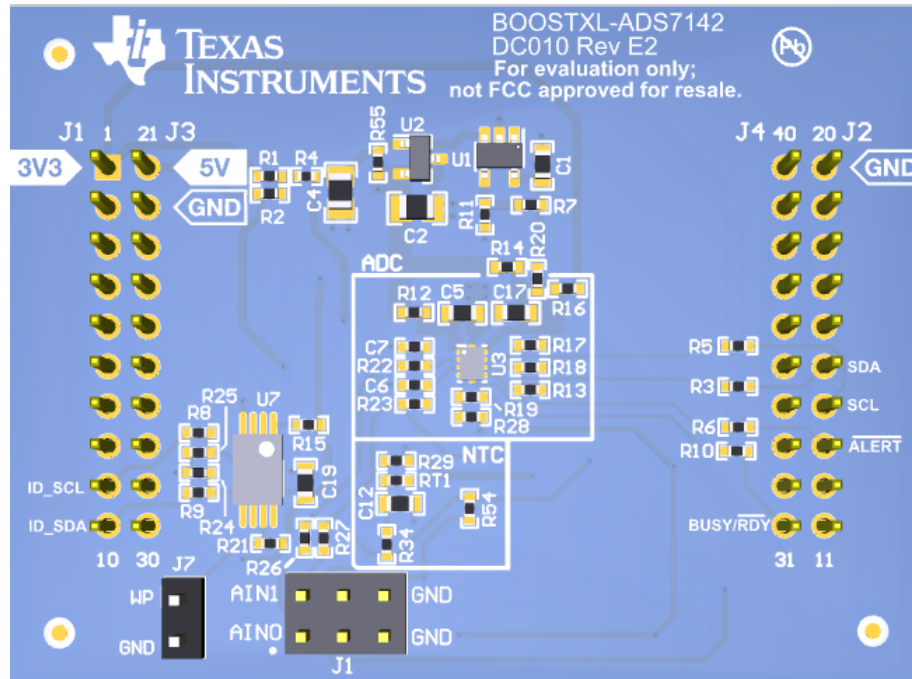


Figure 2. BOOSTXL-ADS7142 Top Level Overview

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 I²C) and the EEPROM (over a secondary I²C). 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](#)).

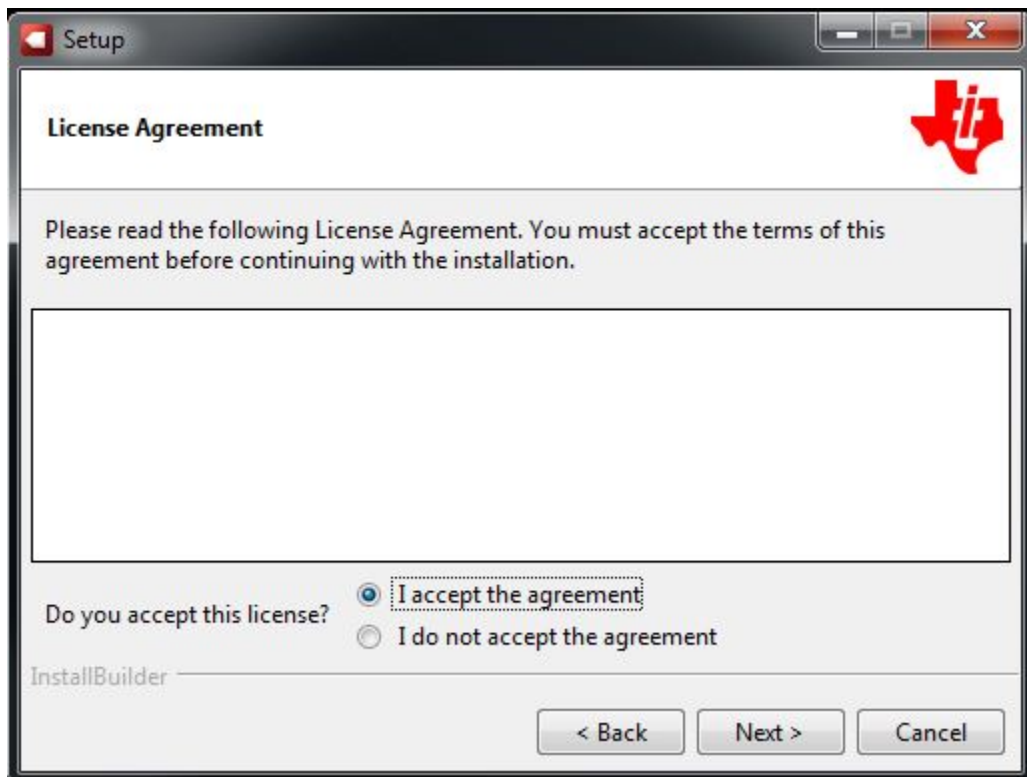


Figure 3. ADS7142 GUI Installation

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.

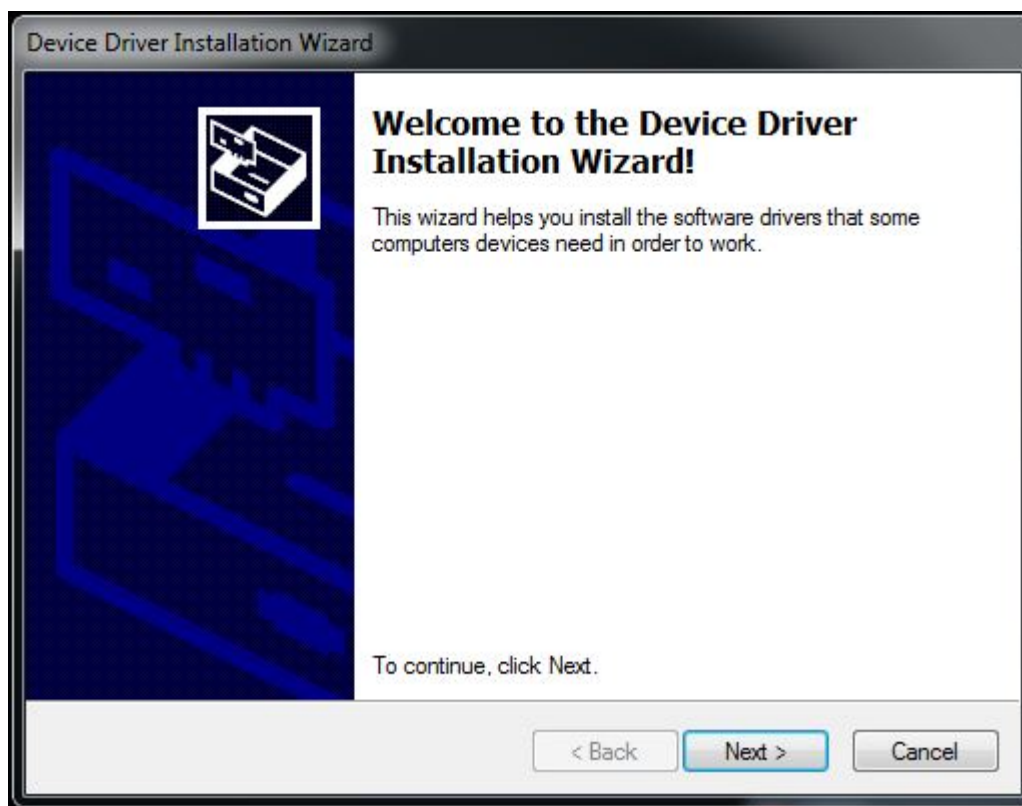


Figure 4. ADS7142 Driver Installation

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](#).

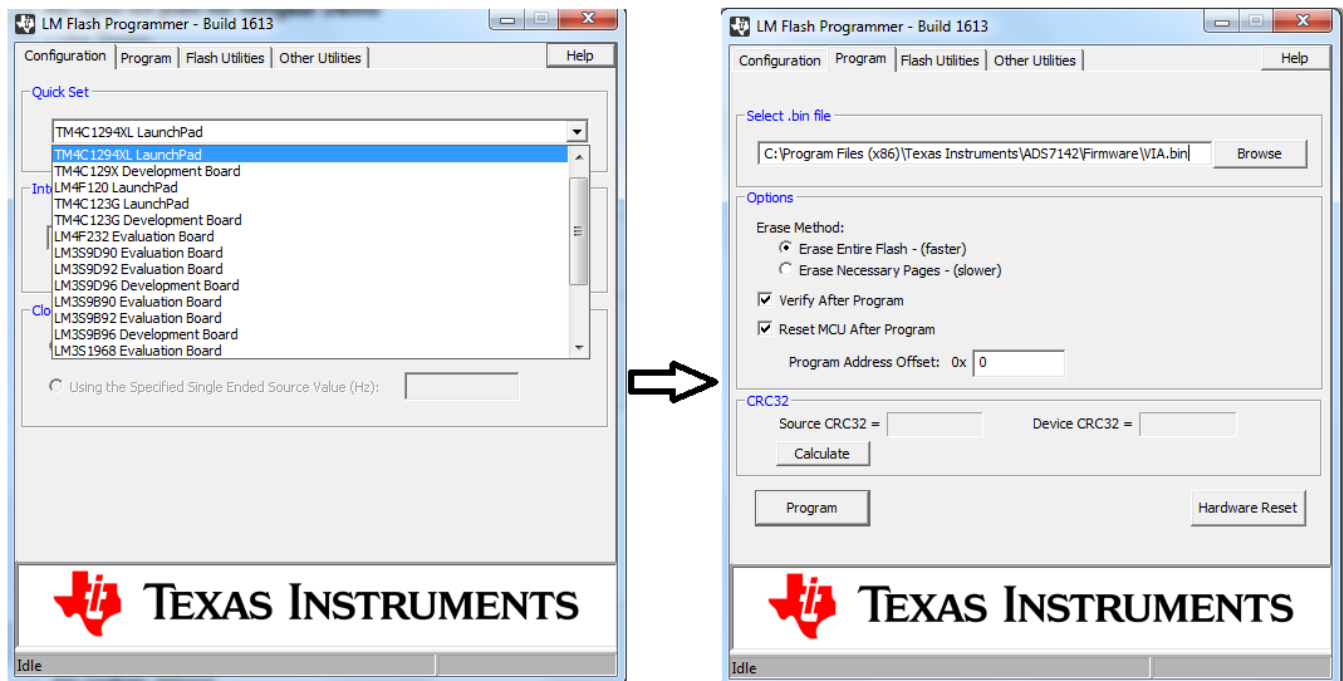


Figure 5. TM4C1294 LaunchPad™ Programming Using LM Flash Programmer

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.

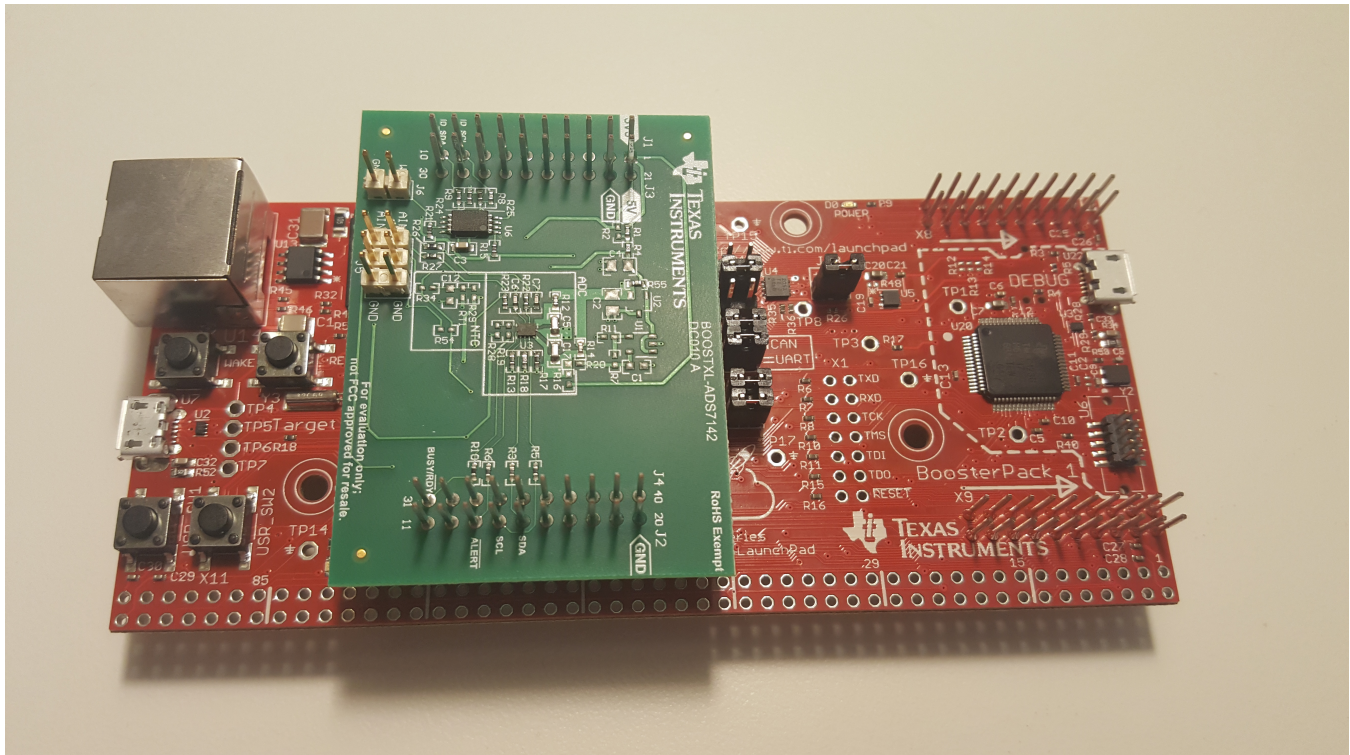


Figure 6. BOOSTXL-ADS7142 Stacked on TM4C1294 LaunchPad™

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.

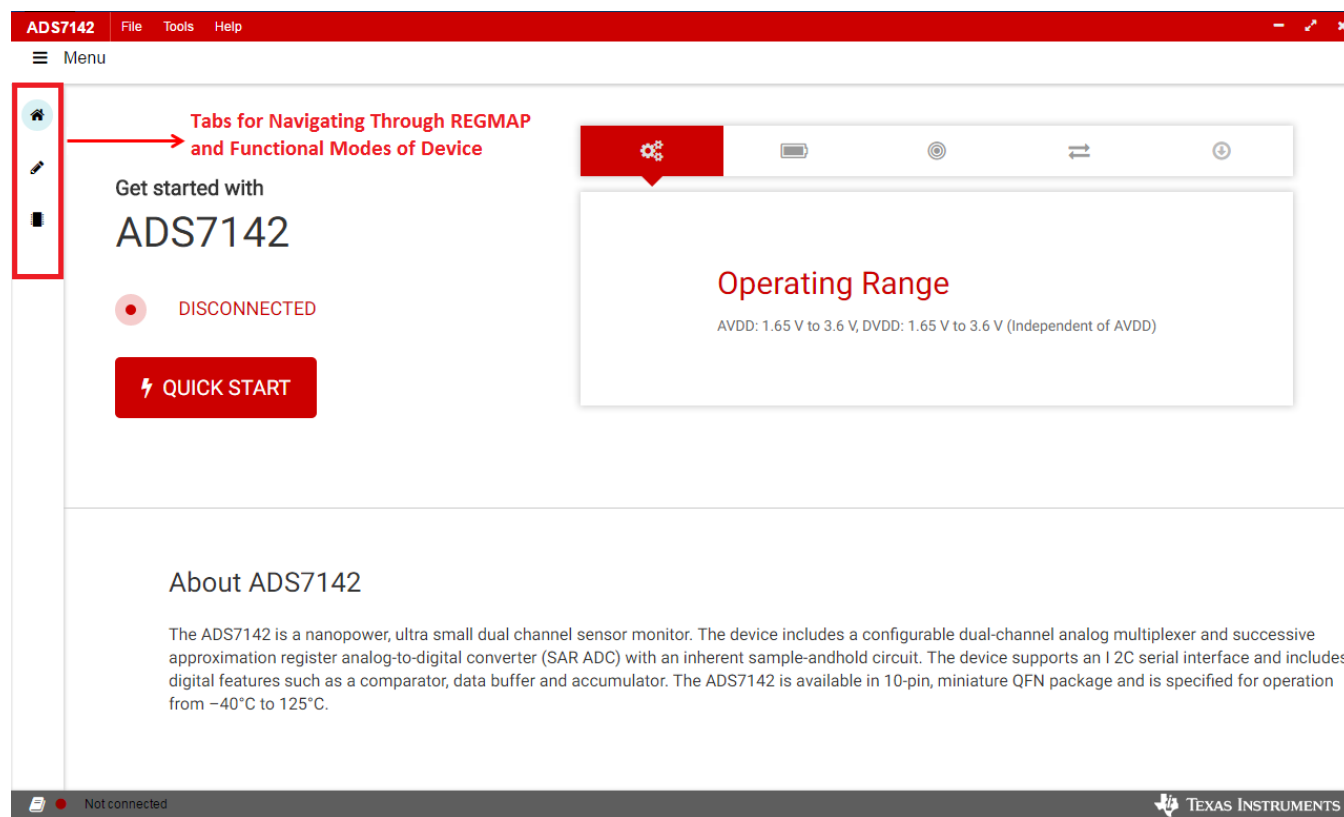
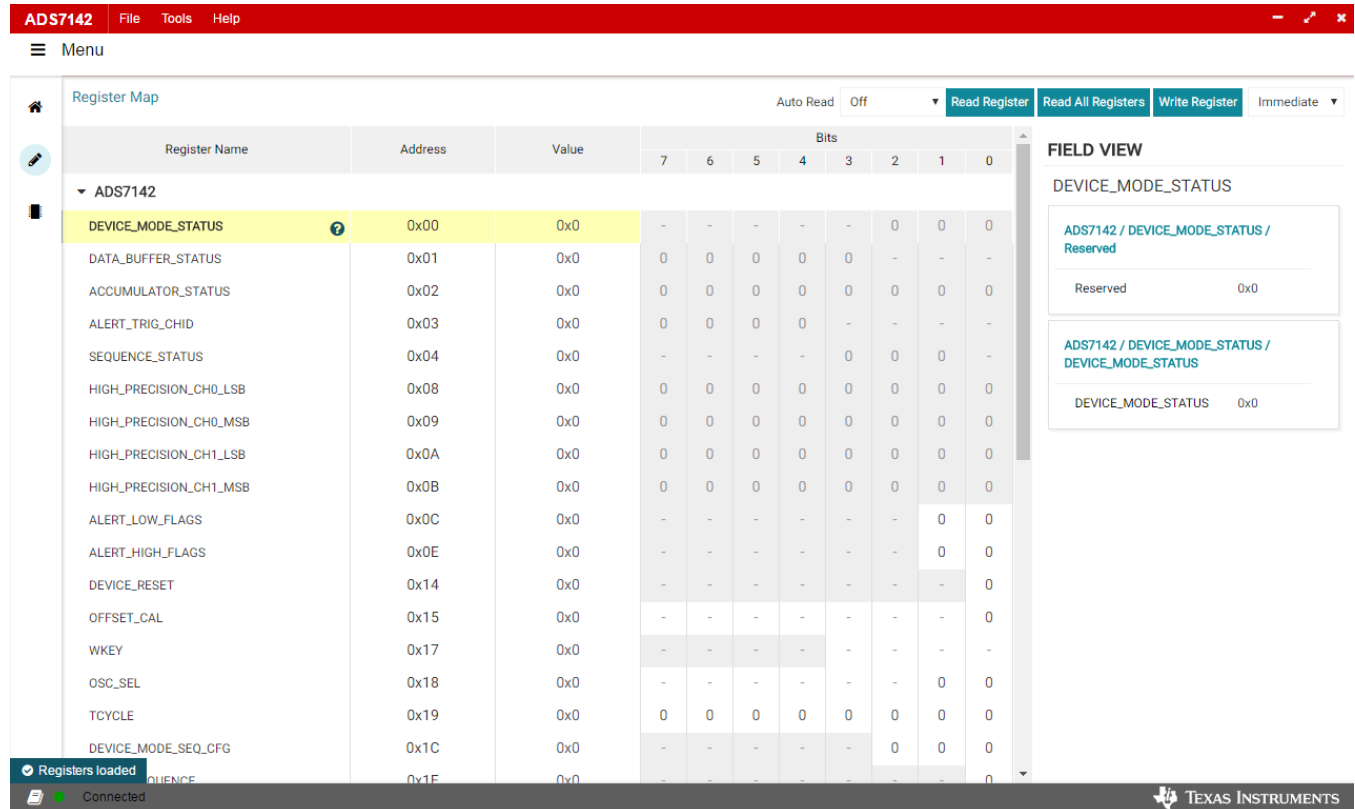


Figure 7. ADS7142 GUI Landing Page

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.



The screenshot displays the ADS7142 Register Map GUI. The top bar includes the title 'ADS7142' and menu options 'File', 'Tools', and 'Help'. Below the menu is a 'Menu' button. The main area is titled 'Register Map' and features a table of registers. The table has columns for 'Register Name', 'Address', 'Value', and 'Bits' (7, 6, 5, 4, 3, 2, 1, 0). The 'DEVICE_MODE_STATUS' register at address 0x00 is highlighted. To the right of the table is a 'FIELD VIEW' panel showing the bit fields for 'DEVICE_MODE_STATUS', including 'Reserved' and 'DEVICE_MODE_STATUS'. The bottom status bar shows 'Registers loaded' and 'Connected'.

Register Name	Address	Value	7	6	5	4	3	2	1	0
DEVICE_MODE_STATUS	0x00	0x0	-	-	-	-	-	0	0	0
DATA_BUFFER_STATUS	0x01	0x0	0	0	0	0	0	-	-	-
ACCUMULATOR_STATUS	0x02	0x0	0	0	0	0	0	0	0	0
ALERT_TRIG_CHID	0x03	0x0	0	0	0	0	-	-	-	-
SEQUENCE_STATUS	0x04	0x0	-	-	-	-	0	0	0	-
HIGH_PRECISION_CH0_LSB	0x08	0x0	0	0	0	0	0	0	0	0
HIGH_PRECISION_CH0_MSB	0x09	0x0	0	0	0	0	0	0	0	0
HIGH_PRECISION_CH1_LSB	0x0A	0x0	0	0	0	0	0	0	0	0
HIGH_PRECISION_CH1_MSB	0x0B	0x0	0	0	0	0	0	0	0	0
ALERT_LOW_FLAGS	0x0C	0x0	-	-	-	-	-	-	0	0
ALERT_HIGH_FLAGS	0x0E	0x0	-	-	-	-	-	-	0	0
DEVICE_RESET	0x14	0x0	-	-	-	-	-	-	-	0
OFFSET_CAL	0x15	0x0	-	-	-	-	-	-	-	0
WKEY	0x17	0x0	-	-	-	-	-	-	-	-
OSC_SEL	0x18	0x0	-	-	-	-	-	-	0	0
TCYCLE	0x19	0x0	0	0	0	0	0	0	0	0
DEVICE_MODE_SEQ_CFG	0x1C	0x0	-	-	-	-	-	-	0	0
SEQUENCE	0x1E	0x0	-	-	-	-	-	-	-	0

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 I²C 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.

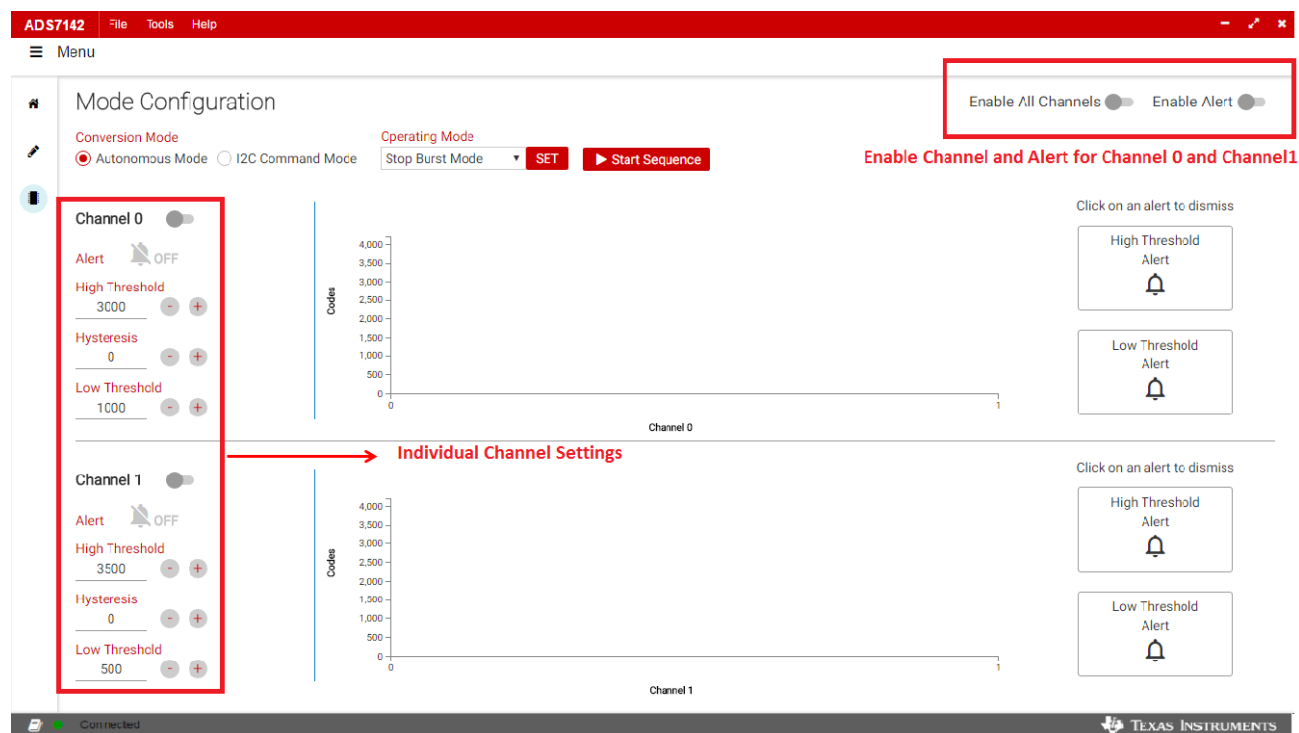


Figure 9. ADS7142 Mode Configuration Page

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.

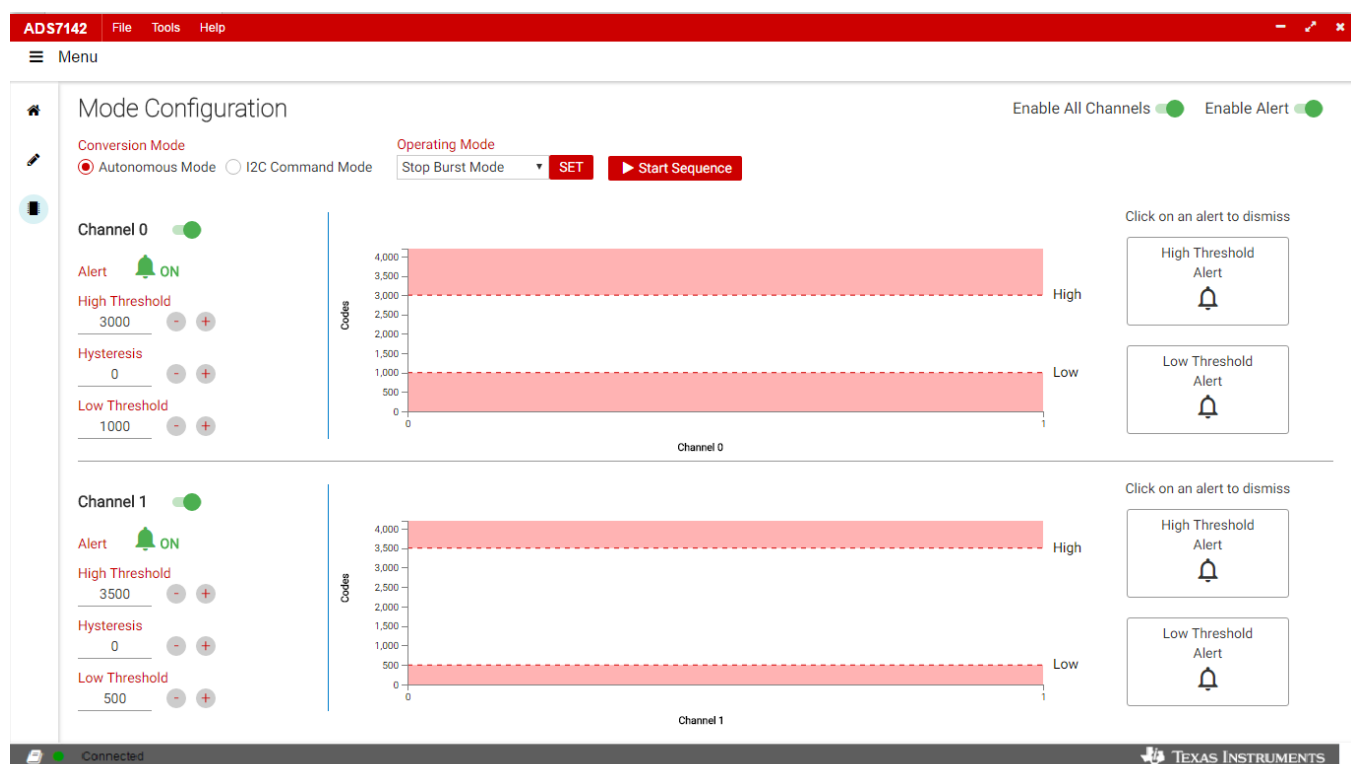


Figure 10. ADS7142 General Instructions Page

4 ADS7142 GUI Functional Modes

The ADS7142 device has the following functional modes:

- **Manual Mode:** In this mode, the host provides I²C 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 Burst 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*.

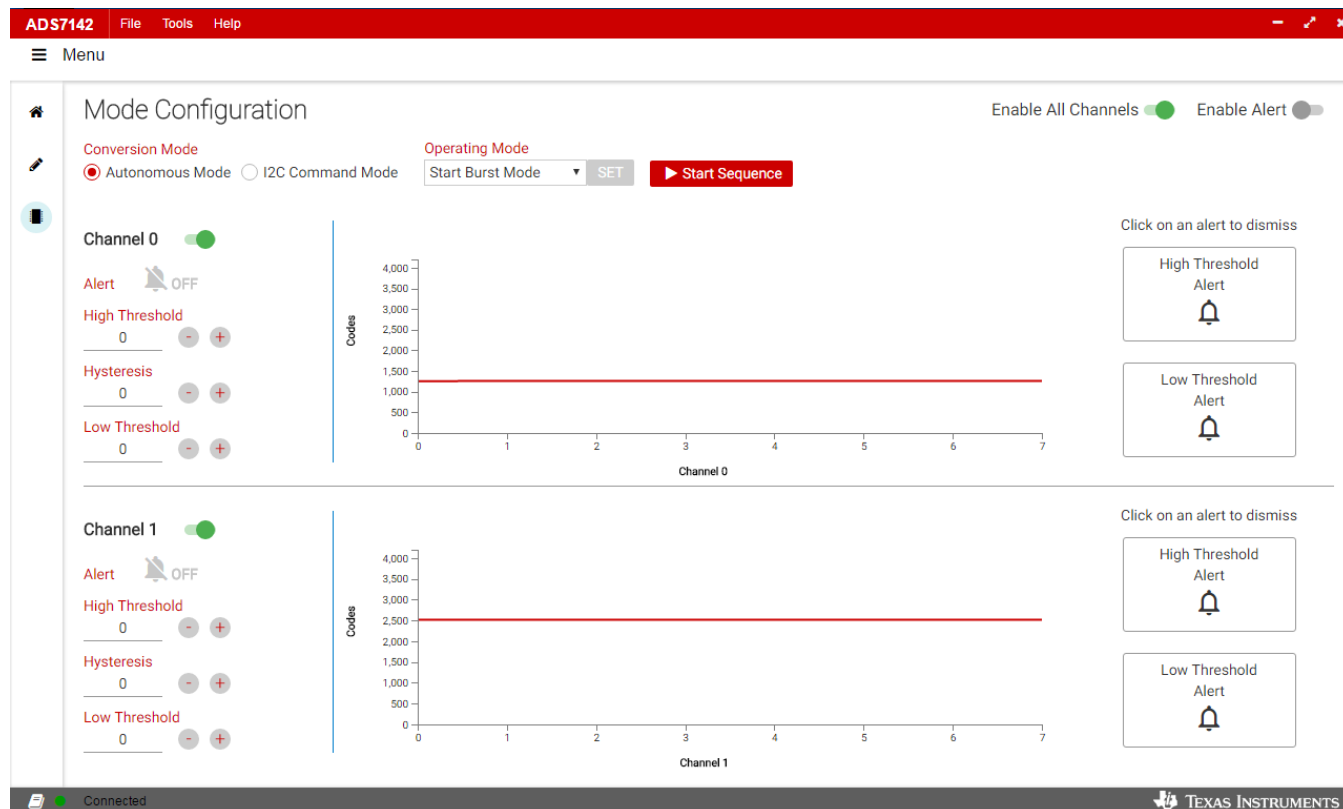


Figure 11. Data Capture in Start Burst Mode

4.1.2 Stop Burst Mode

When *Stop Burst 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*.

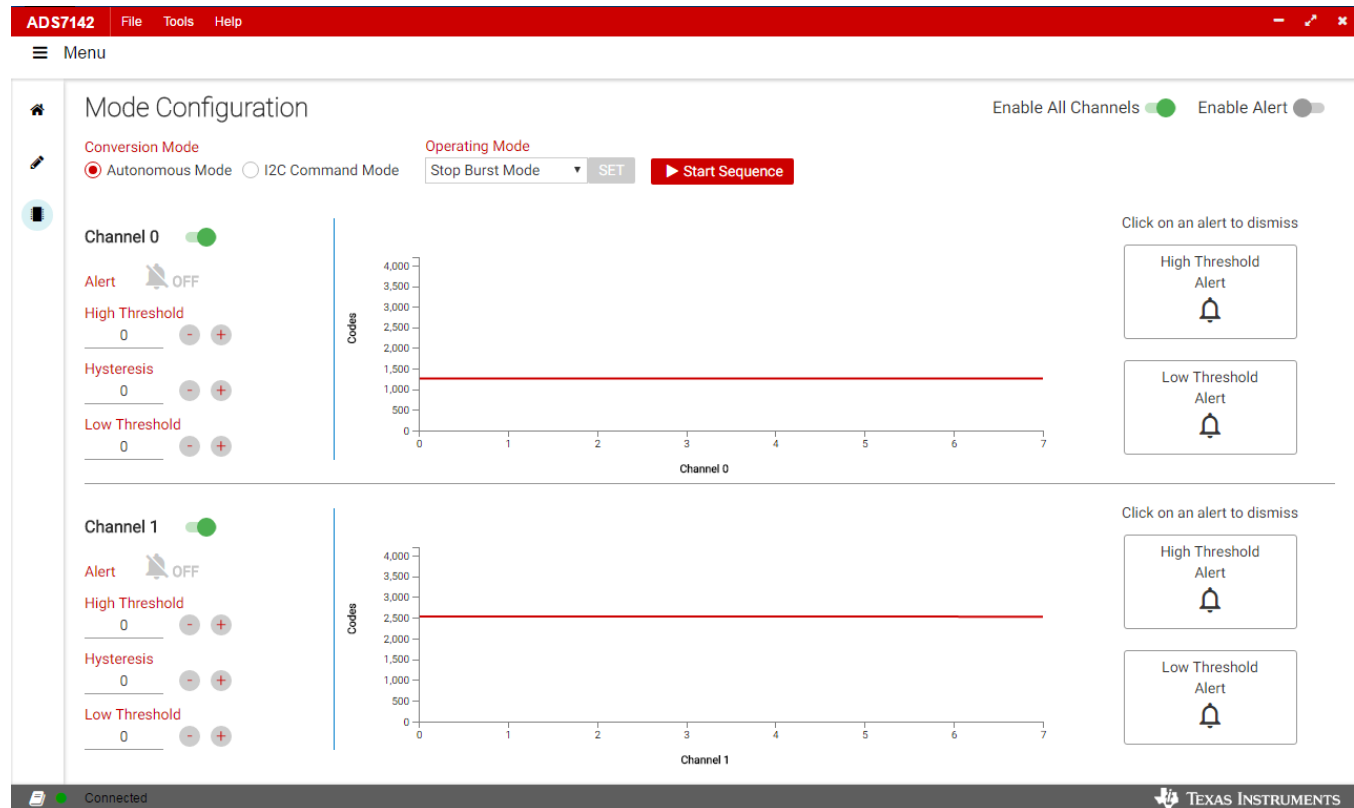


Figure 12. Data Capture in Stop Burst Mode

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.

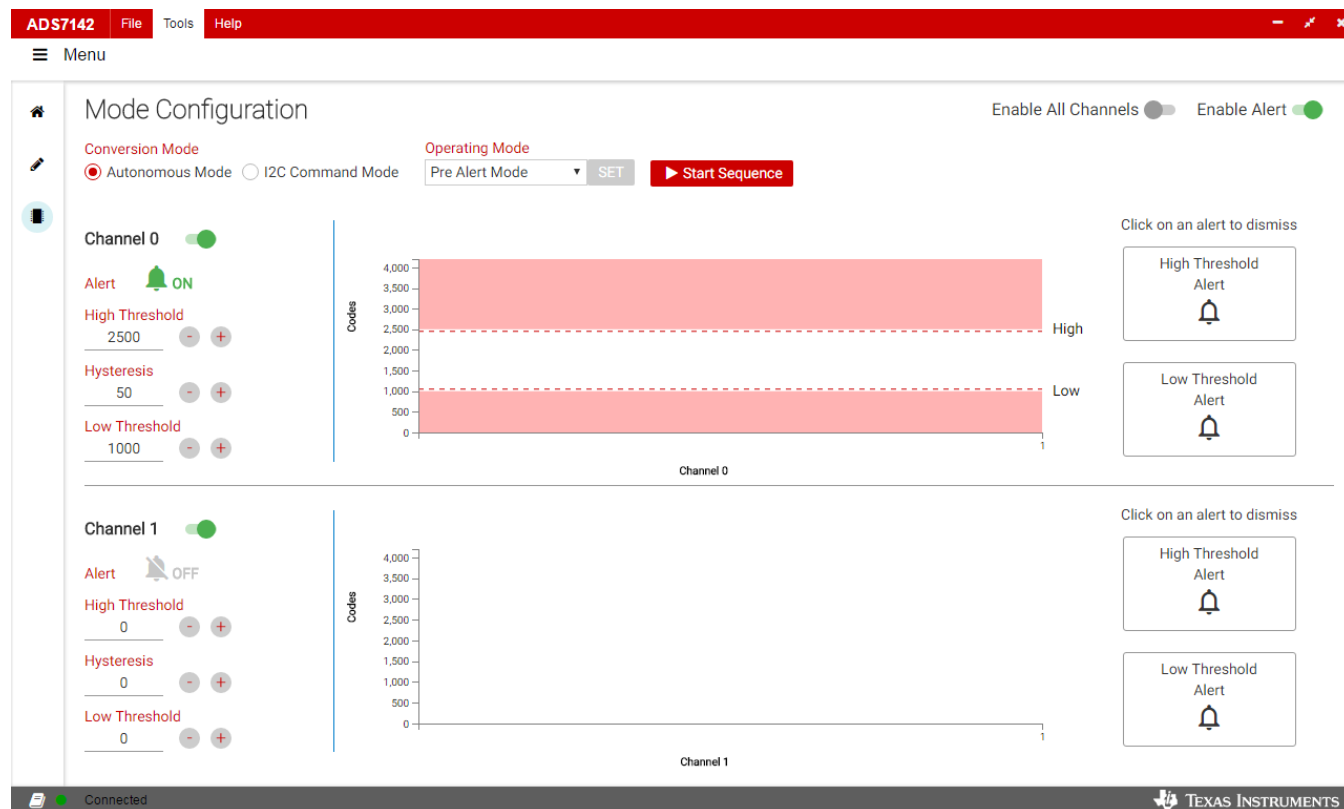


Figure 13. Operation in Pre Alert Mode

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.

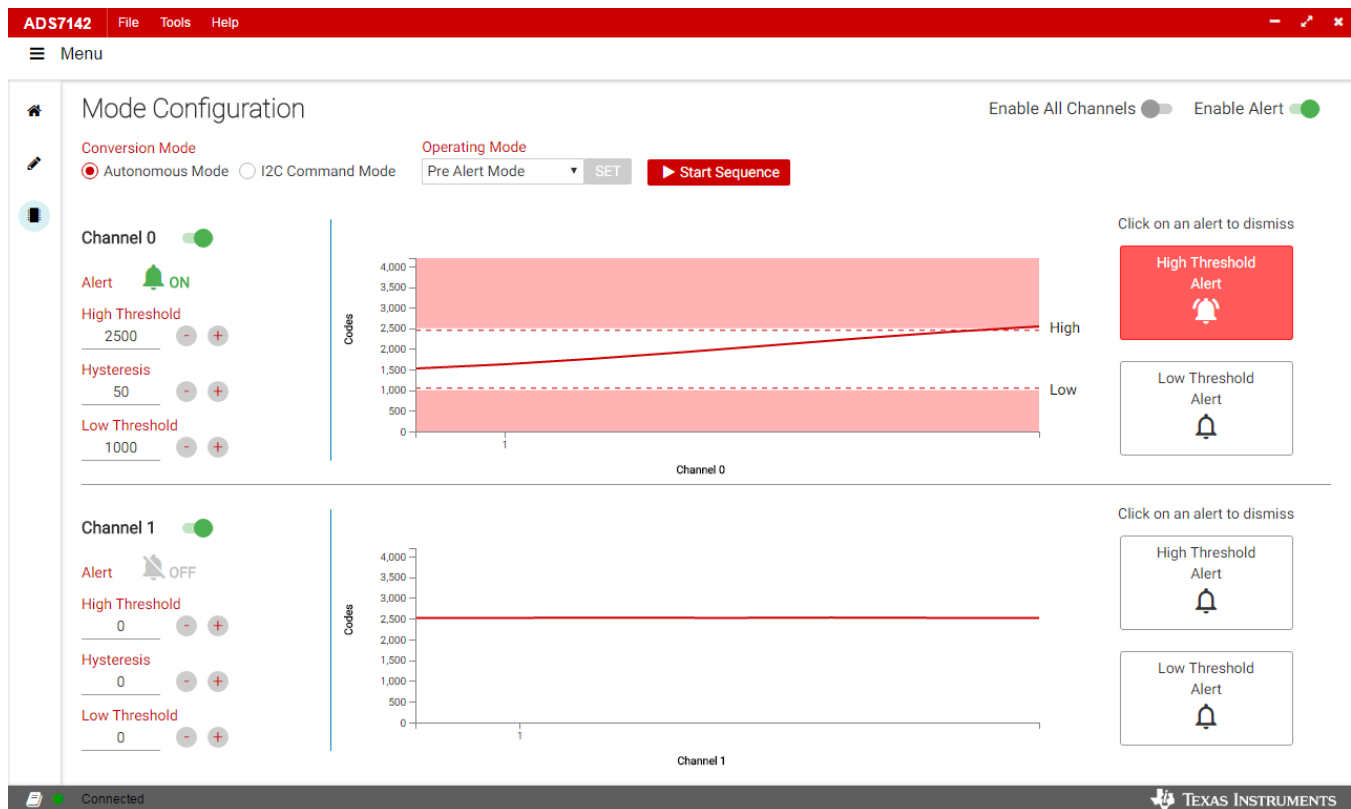


Figure 14. Operation After Alert Condition

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.

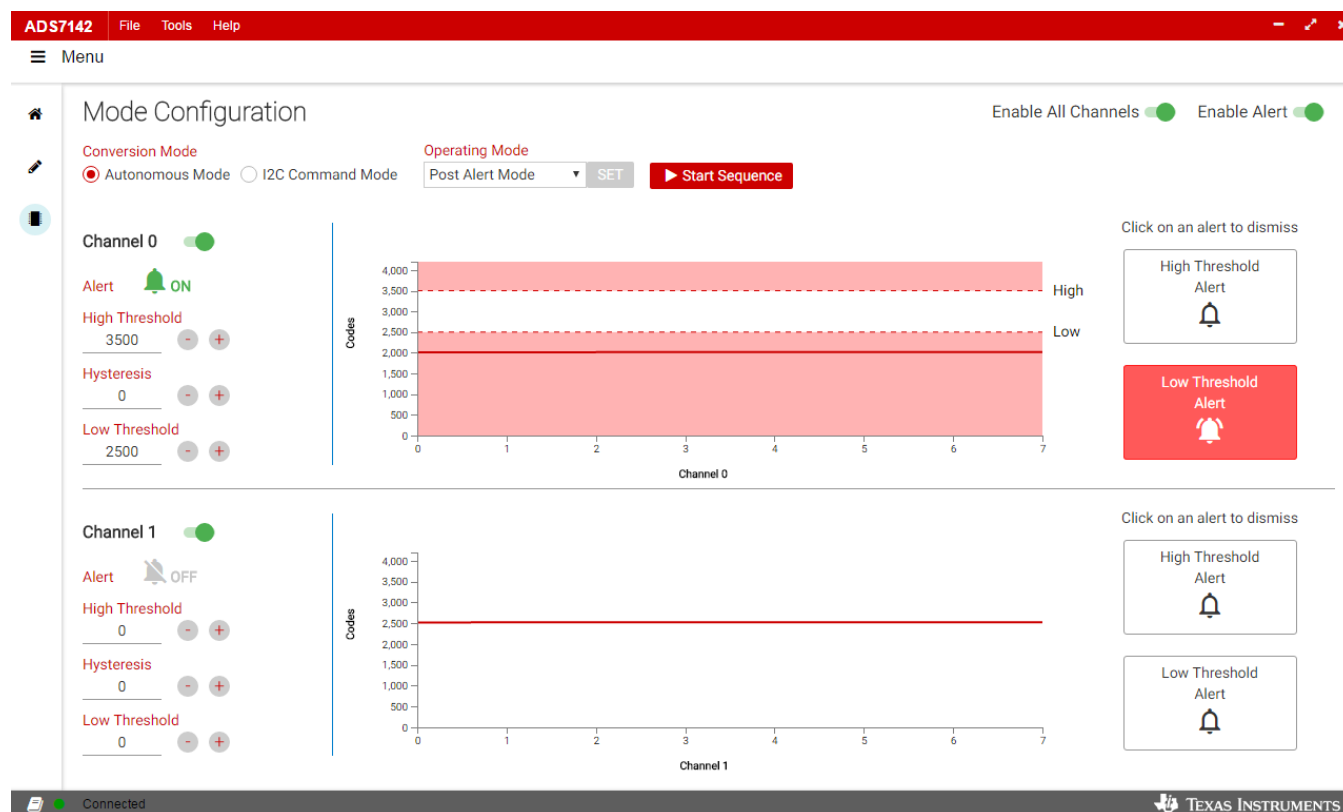


Figure 15. Operation in Post Alert Mode

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 the accumulator after 16 conversions. 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.

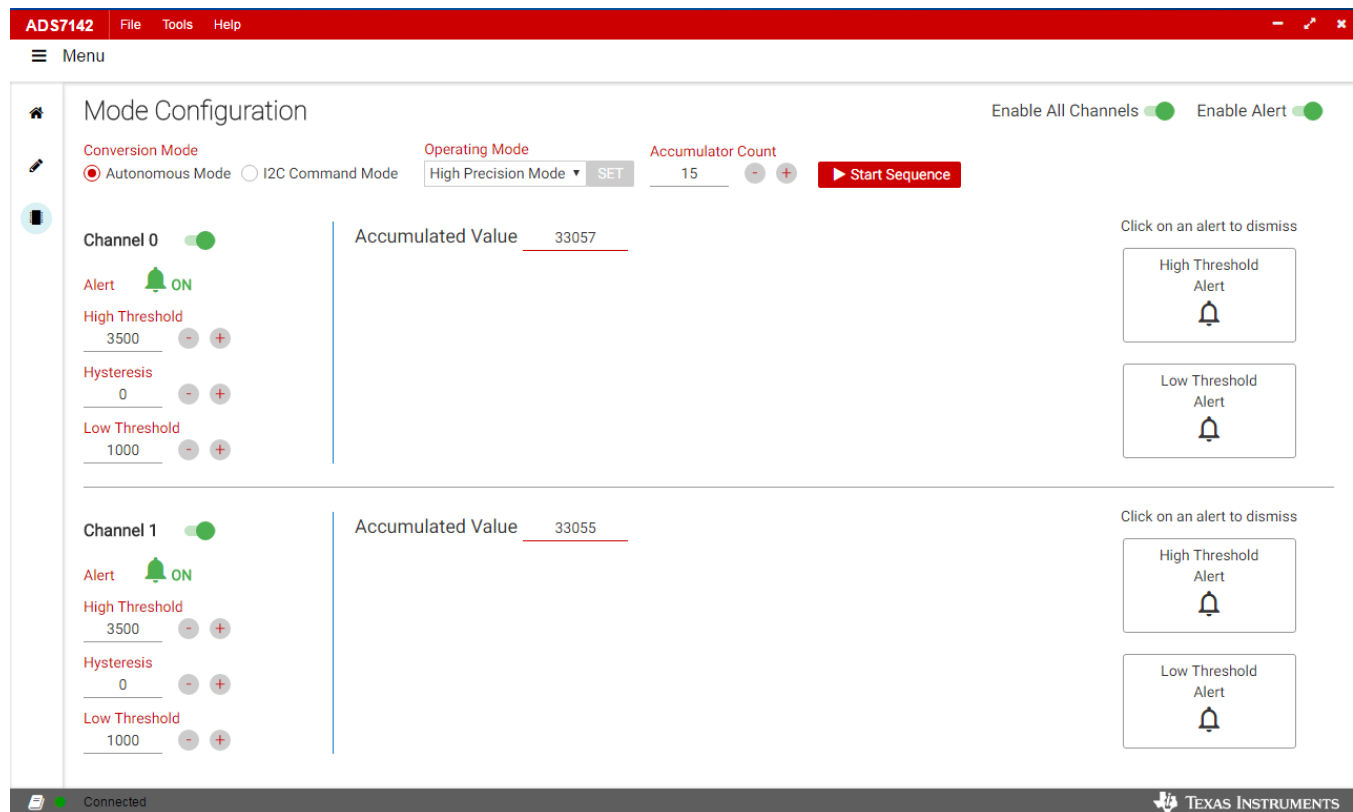


Figure 16. Operation in High Precision Mode

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 I²C command from the host processor and the captured data is then returned over the I²C 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*.

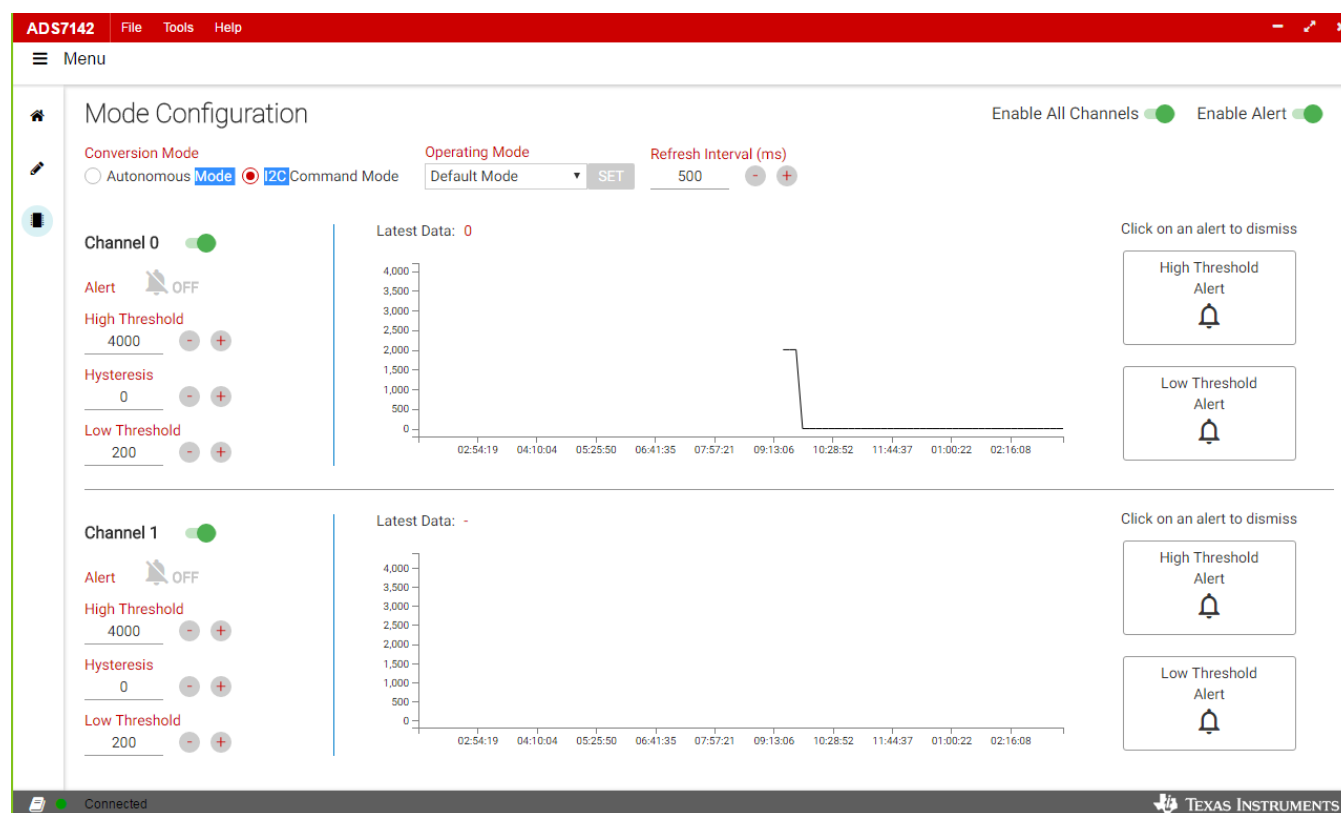


Figure 17. Operation in Default Manual Mode

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.

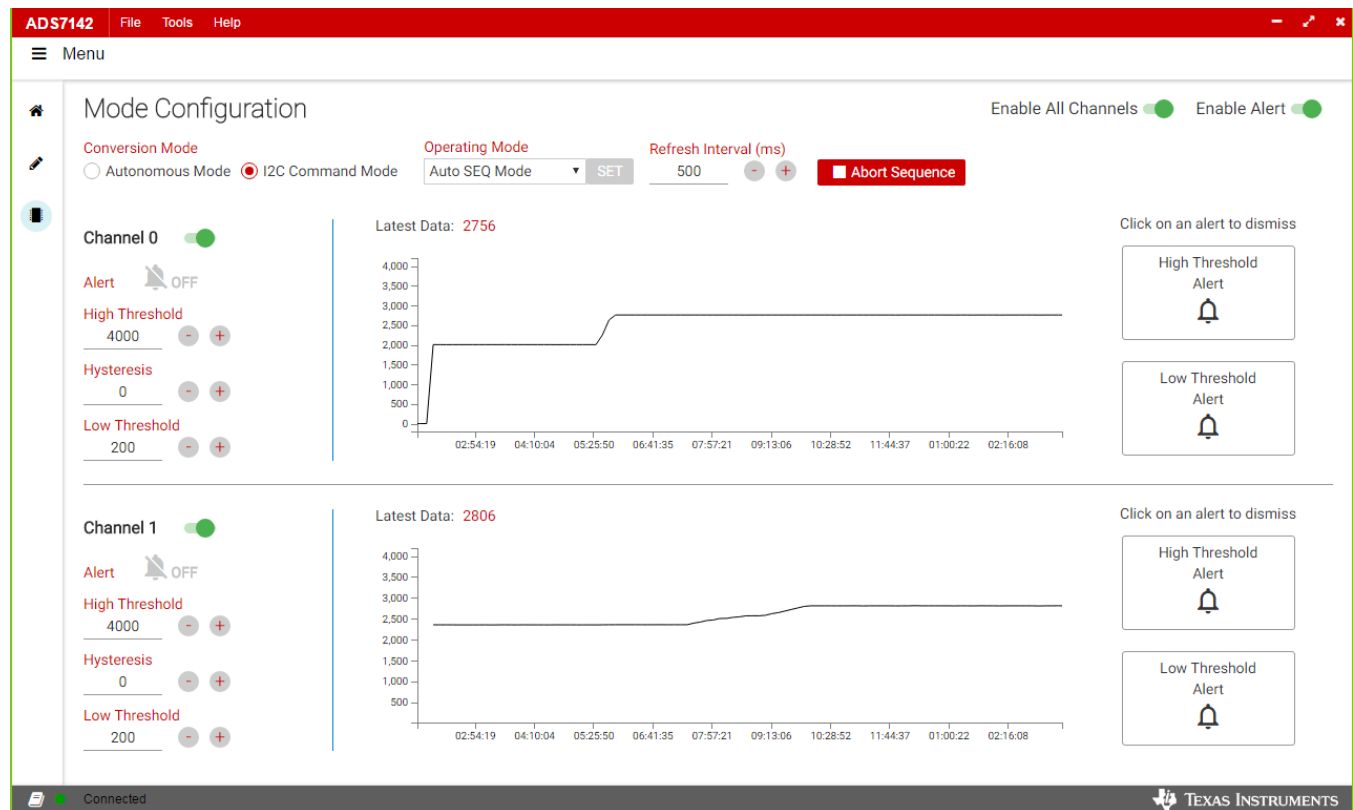


Figure 18. Operation in Auto Manual Mode

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 ² C 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%, COG/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), Zero-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.

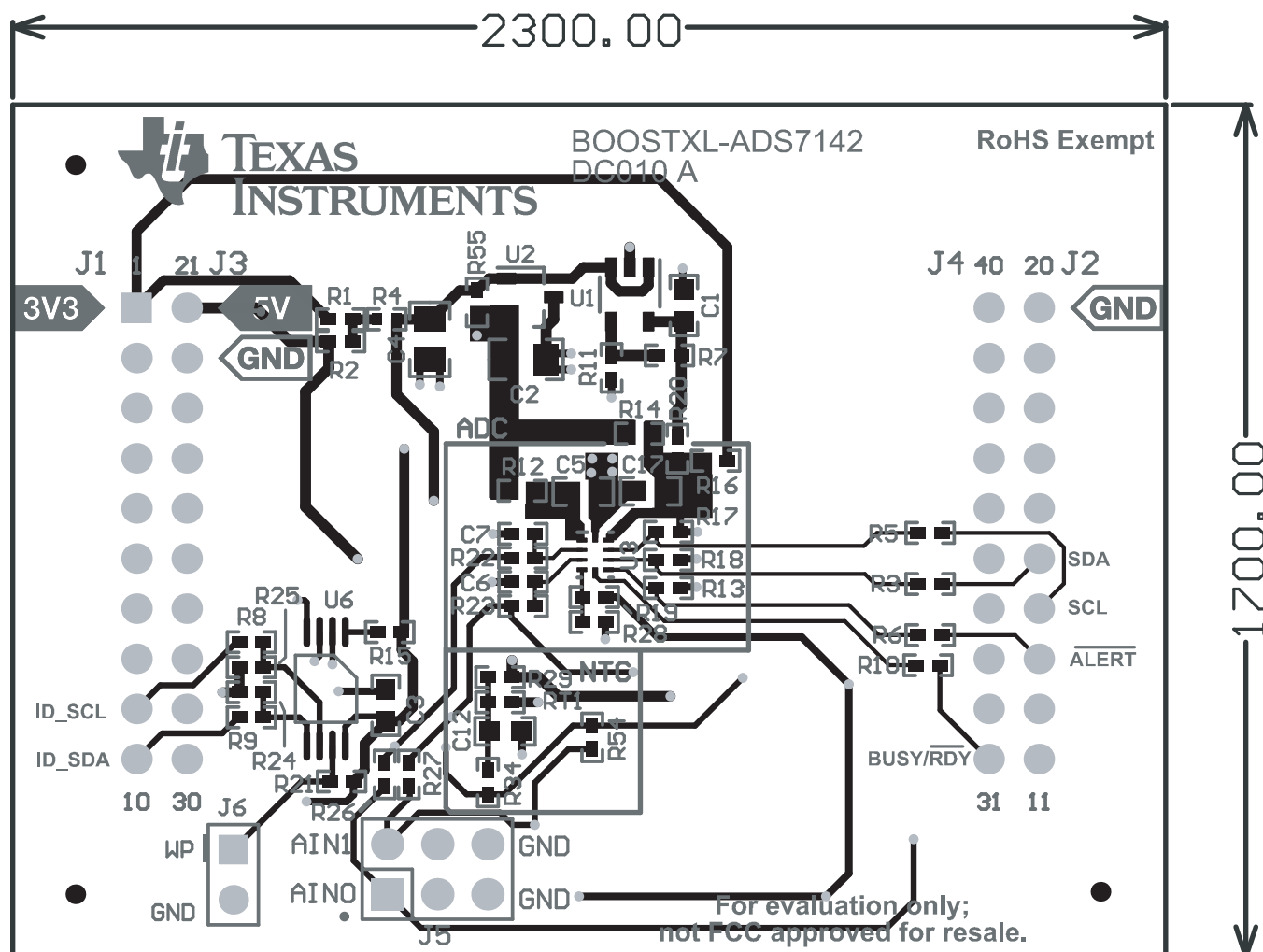


Figure 19. BOOSTXL-ADS7142 Top Layer Copper and Silkscreen

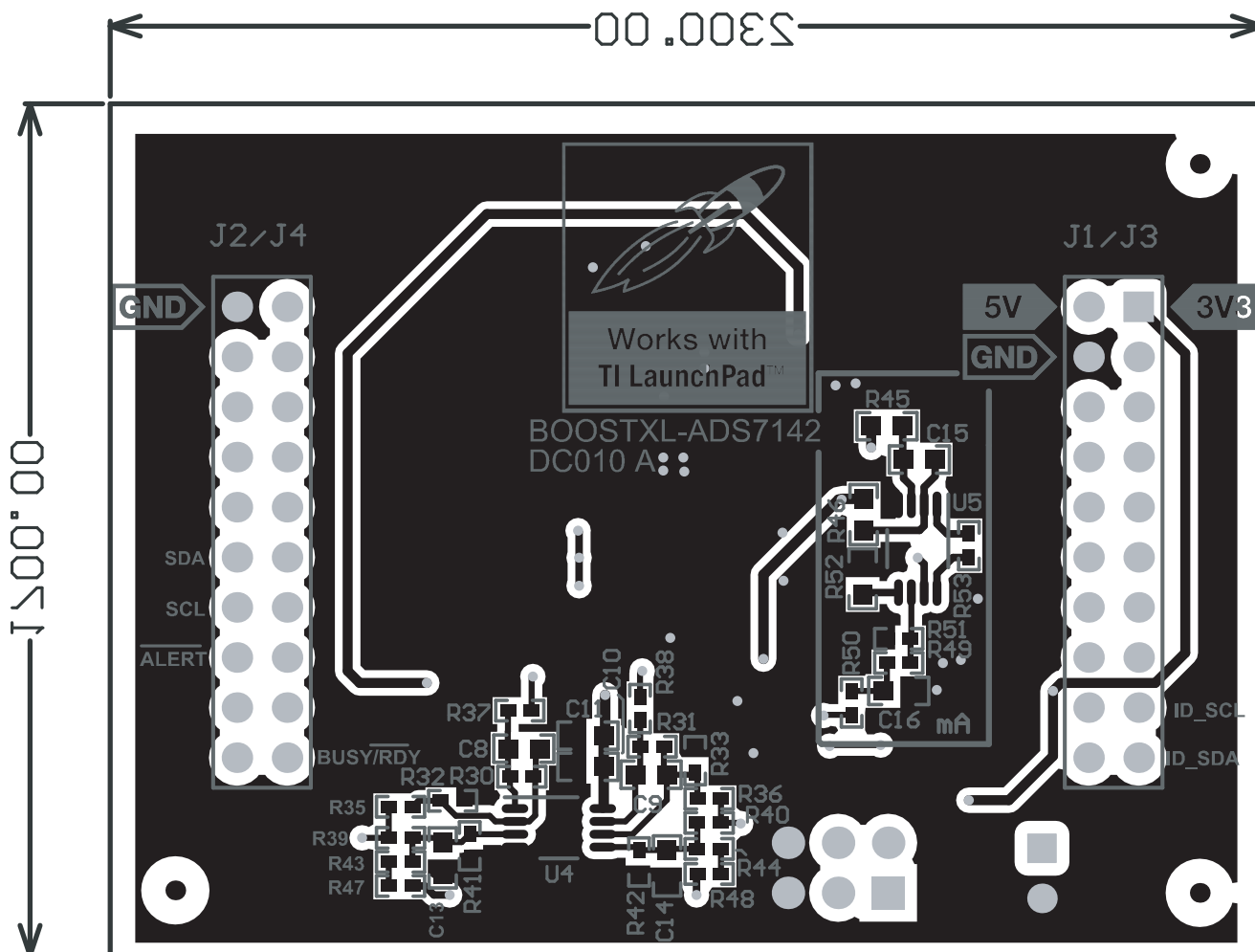


Figure 20. BOOSTXL-ADS7142 Bottom Layer Copper and Silkscreen

5.3 Schematics

Figure 21 and illustrate the ADS7142 BoosterPack schematics.

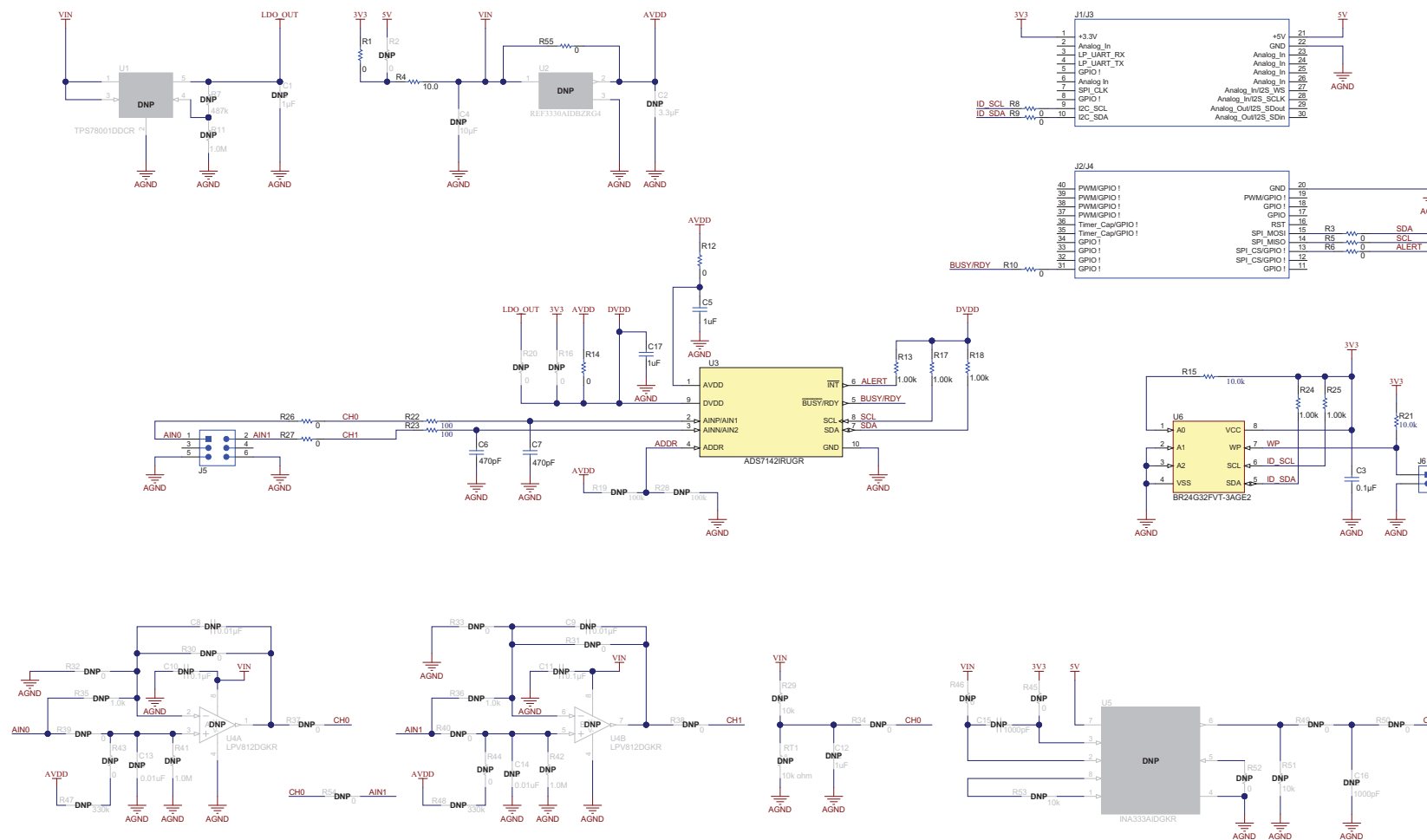


Figure 21. ADS7142 BoosterPack™ Schematic Diagram

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

Changes from Original (August 2017) to A Revision Page

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

STANDARD TERMS FOR EVALUATION MODULES

1. **Delivery:** TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an "EVM" or "EVMs") to the User ("User") in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.
 - 1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductor products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM ("Software") shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software
 - 1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.
2. **Limited Warranty and Related Remedies/Disclaimers:**
 - 2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.
 - 2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.
 - 2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.
3. **Regulatory Notices:**
 - 3.1 **United States**
 - 3.1.1 **Notice applicable to EVMs not FCC-Approved:**

FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.
 - 3.1.2 **For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:**

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.

FCC Interference Statement for Class A EVM devices

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

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *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.*

3.2 Canada

3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(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.

Concerning EVMs Including Detachable Antennas:

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.

3.3 Japan

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/llds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/llds/ti_ja/general/eStore/notice_01.page

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

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.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。技術適合証明を受けていないもののご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。日本テキサス・インスツルメンツ株式会社
東京都新宿区西新宿 6 丁目 2 4 番 1 号
西新宿三井ビル

3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_02.page
電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。 http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_02.page

3.4 *European Union*

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive):*

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 *Safety-Related Warnings and Restrictions:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user 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, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

6. *Disclaimers:*

6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

8.1 *General Limitations.* IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS, REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMNITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

IMPORTANT NOTICE FOR TI DESIGN INFORMATION AND RESOURCES

Texas Instruments Incorporated ("TI") technical, application or other design advice, services or information, including, but not limited to, reference designs and materials relating to evaluation modules, (collectively, "TI Resources") are intended to assist designers who are developing applications that incorporate TI products; by downloading, accessing or using any particular TI Resource in any way, you (individually or, if you are acting on behalf of a company, your company) agree to use it solely for this purpose and subject to the terms of this Notice.

TI's provision of TI Resources does not expand or otherwise alter TI's applicable published warranties or warranty disclaimers for TI products, and no additional obligations or liabilities arise from TI providing such TI Resources. TI reserves the right to make corrections, enhancements, improvements and other changes to its TI Resources.

You understand and agree that you remain responsible for using your independent analysis, evaluation and judgment in designing your applications and that you have full and exclusive responsibility to assure the safety of your applications and compliance of your applications (and of all TI products used in or for your applications) with all applicable regulations, laws and other applicable requirements. You represent that, with respect to your applications, you have all the necessary expertise to create and implement safeguards that (1) anticipate dangerous consequences of failures, (2) monitor failures and their consequences, and (3) lessen the likelihood of failures that might cause harm and take appropriate actions. You agree that prior to using or distributing any applications that include TI products, you will thoroughly test such applications and the functionality of such TI products as used in such applications. TI has not conducted any testing other than that specifically described in the published documentation for a particular TI Resource.

You are authorized to use, copy and modify any individual TI Resource only in connection with the development of applications that include the TI product(s) identified in such TI Resource. NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT OF TI OR ANY THIRD PARTY IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information regarding or referencing third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of TI Resources may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

TI RESOURCES ARE PROVIDED "AS IS" AND WITH ALL FAULTS. TI DISCLAIMS ALL OTHER WARRANTIES OR REPRESENTATIONS, EXPRESS OR IMPLIED, REGARDING TI RESOURCES OR USE THEREOF, INCLUDING BUT NOT LIMITED TO ACCURACY OR COMPLETENESS, TITLE, ANY EPIDEMIC FAILURE WARRANTY AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY YOU AGAINST ANY CLAIM, INCLUDING BUT NOT LIMITED TO ANY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON ANY COMBINATION OF PRODUCTS EVEN IF DESCRIBED IN TI RESOURCES OR OTHERWISE. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, DIRECT, SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF TI RESOURCES OR USE THEREOF, AND REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

You agree to fully indemnify TI and its representatives against any damages, costs, losses, and/or liabilities arising out of your non-compliance with the terms and provisions of this Notice.

This Notice applies to TI Resources. Additional terms apply to the use and purchase of certain types of materials, TI products and services. These include; without limitation, TI's standard terms for semiconductor products (<http://www.ti.com/sc/docs/stdterms.htm>), [evaluation modules](#), and [samples](http://www.ti.com/sc/docs/sampterm.htm) (<http://www.ti.com/sc/docs/sampterm.htm>).

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2018, Texas Instruments Incorporated