

ADS1293EVM User's Guide

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1. Introduction

The Texas Instruments' ADS1293EVM evaluation module (EVM) helps designers evaluate the operation and performance of the ADS1293, Low Power Scalable 24-Bit Analog Front End for ECG Monitoring. The device offers configurability and can be setup to perform a 3-Lead or 5-Lead configuration using an ECG Simulator.

The EVM contains one device (See Table 1).

Table 1: Device and Package Configuration

	IC	PACKAGE
U1	ADS1293	LLP-28

2. Setup

This section describes the jumpers and connectors on the EVM, software installation, and how to properly connect, set up, and use the ADS1293EVM.

2.1. Input/Output Connector Description

JP1: Battery is the battery input terminal for the ADS1293.

J2: SPI Probe is a header that allows user to probe the ADS1293's DRDYB, SDO, SDI, SCLK, CSB, and ALARMB pins.

JP2: VDD_JMP is the power input terminal for the ADS1293. The jumper header provides a power (VDD_JMP) to the analog power supply, VDD. If a cleaner source is preferred, remove the shunt and apply an external source to test pin VDD_INP.

JP3: VDDIO_JMP is the power input terminal for the ADS1293. The jumper header provides a power (VDDIO_JMP) to the digital IO power supply, VDDIO. If a cleaner source is preferred, remove the shunt and apply an external source to test pin VDDIO.

SW1: Input is the switch that allows user to reset the ADS1293 device.

SW2: Input is the switch that allows user to reset the USB power.

2.2. Software Installation

To ensure that you are using the latest version of ADS1293 software, you can download from our website at <http://www.ti.com/product/ads1293>. You must install the software before you connect the ADS1293EVM to your PC.

To install the ADS1293 Software:

- Log onto <http://www.ti.com/product/ads1293>, then scroll down to the “**Software**” section to download the latest ADS1293 Medical AFE software.
- Unzip the file that you downloaded into a known directory, and run the “TI_MedicalAFE_ADS1293_vx.x.x.x.exe”

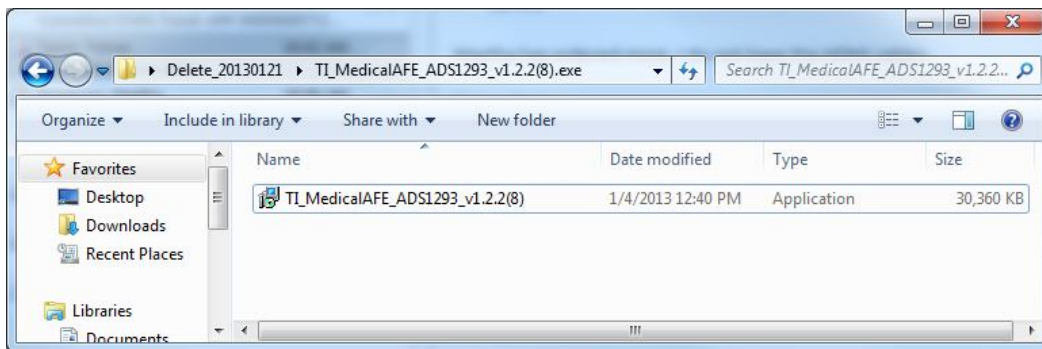


Figure 1: Executable File

- When you see the Welcome screen as shown below, follow the instructions by clicking the “Next” button on the screen to install the software.
- When the installation is finished, please click the “Finish” button



Figure 2: New Hardware

Setup

- Before you launch the ADS1293 software, connect the ADS1293EVM device to a USB port of your PC. Go to your computer's **"Device Manager"** and find **"TI, MSP430"** (see image below). Right click on this and choose **"Update Driver Software"**.

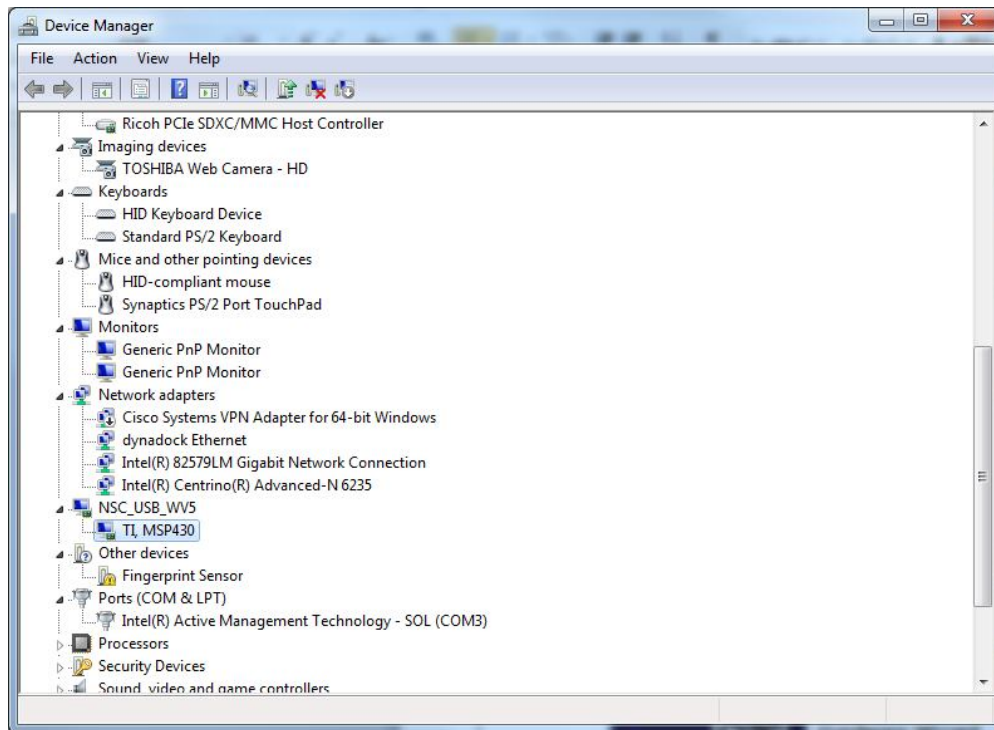


Figure 3: Choose Installation Method

- Find the MSP430 driver by looking under the location where you downloaded the ADS1293 software. This driver is located in the folders **"hardware>>driver"**. For example, the driver is probably located in the folder **"C:\Program Files (x86)\Texas Instruments\ADS1293\hardware\driver"**

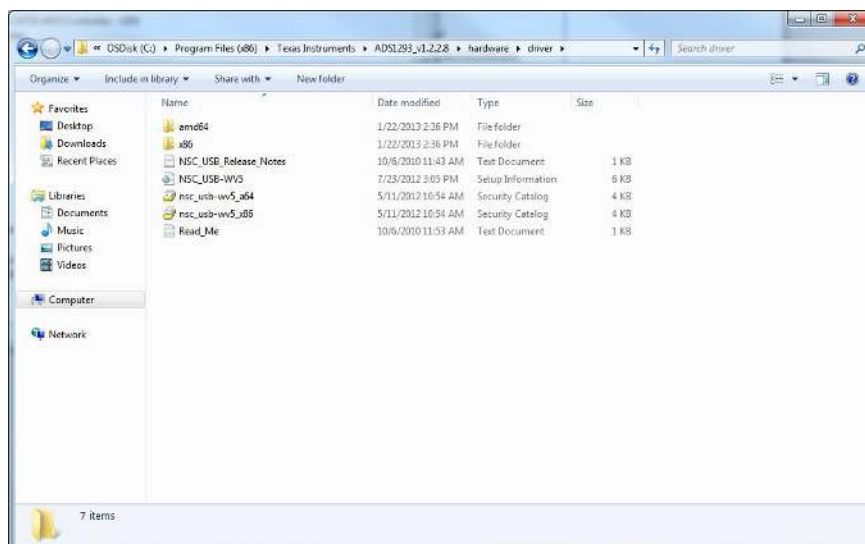


Figure 4: Choosing MSP430 Driver

- Wait until installation completes before starting the software.

2.3. Operation

The figure below shows the connection between the ADS1293EVM and a personal computer with the ADS1293's software. The figures below show both the top and bottom of the board. For proper operation of the ADS1293EVM, J3 and J4 should be properly configured.

For this quick start, connect the following jumpers:
 Jumper pins 1 & 2 of JP2 to connect VDD to 3.3V
 Jumper pins 1 & 2 of JP3 to connect VDDIO to 3.3V



Figure 5: ADS1293EVM Top View



Figure 6: ADS1293EVM Bottom View

2.3.1. 3-Lead ECG Application

The following procedures show a quick method to assemble the ADS1293 and perform an evaluation for a 3-Lead configuration using an ECG Simulator.

- Connect the following electrodes to the ADS1293EVM:
 Connect **RA** to **IN1**
 Connect **LA** to **IN2**
 Connect **LL** to **IN3**
 Connect **RL** to **IN4**

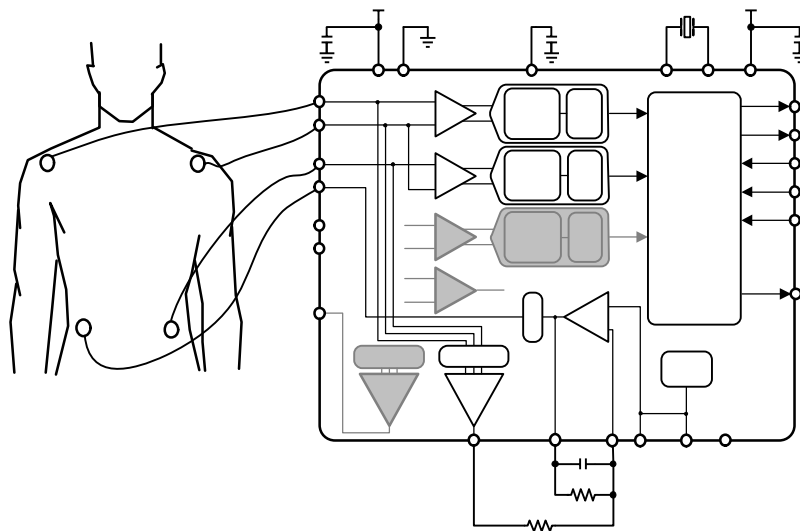


Figure 7: 3-LEAD ECG Connection

- Open the ADS1293 software. On the upper left hand side of the GUI, under the “**Lead Configuration**” field, choose the “**3-Lead**” application.
- After the 3-lead application has been selected, the software will automatically change the registers for this application. To see what registers have been changed, click on the “**Register Map**” icon located on the upper left hand of the GUI (see image below).

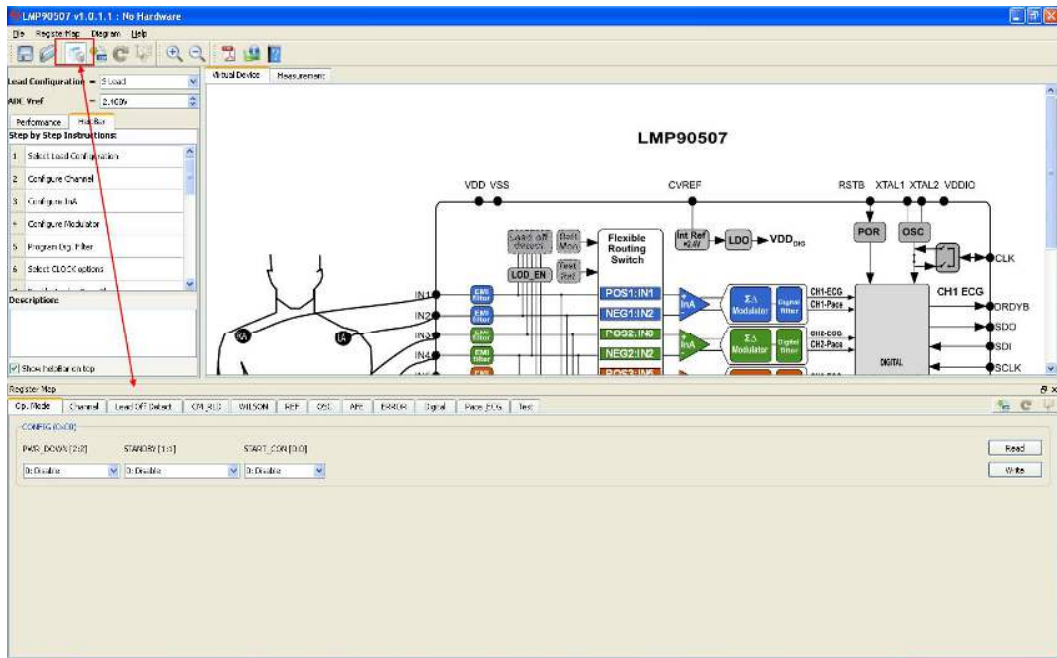


Figure 8: Register Map

- Click on the “Measurement” tab and set the **Capture Mode** to “run continuously”. Click on the “Run” button to view the output voltage plot. An ECG reading for 2 channels (similar to the image below) should have been plotted.

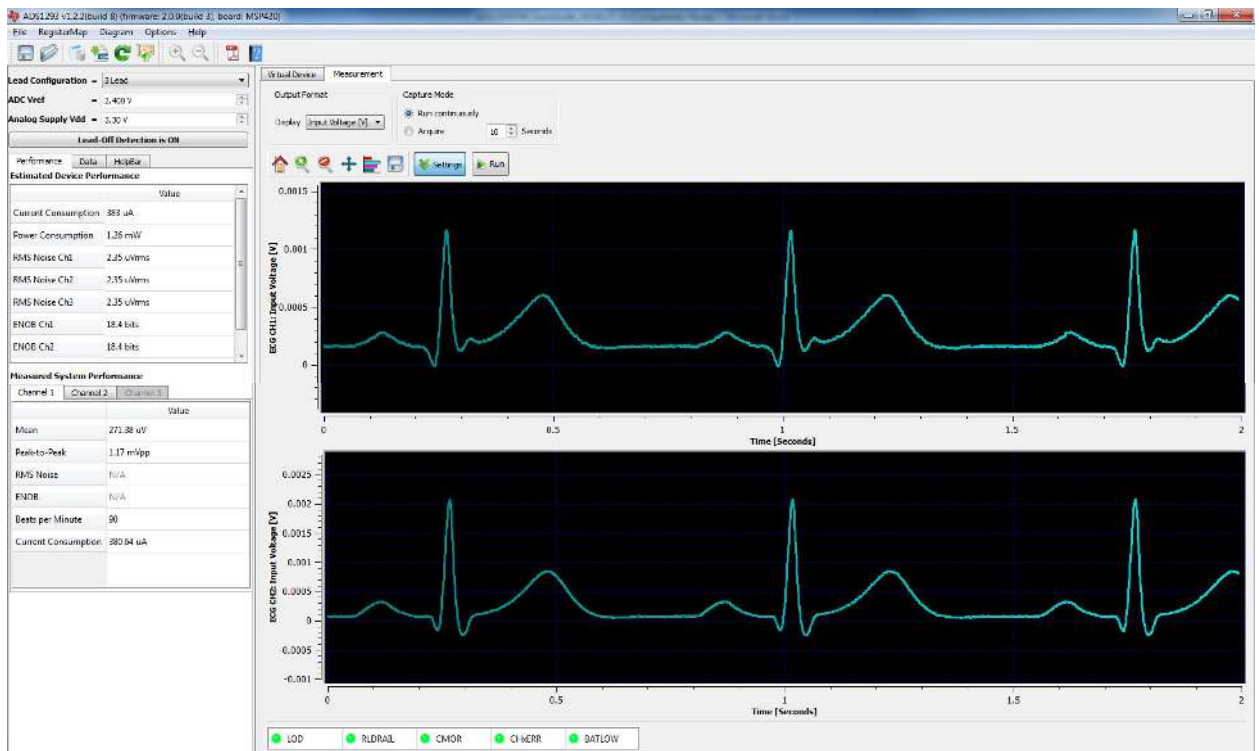


Figure 9: ECG Plot for 2-channels (3-lead) measurements

2.3.2. 5-Lead ECG Application

The following procedures show a quick method to assemble the ADS1293 and perform an evaluation for a 5-Lead Configuration using an ECG Simulator.

- Connect the following electrode to the ADS1293EVM
 Connect **RA** to **IN1**
 Connect **LA** to **IN2**
 Connect **LL** to **IN3**
 Connect **RL** to **IN4**
 Connect **V1** to **IN5**

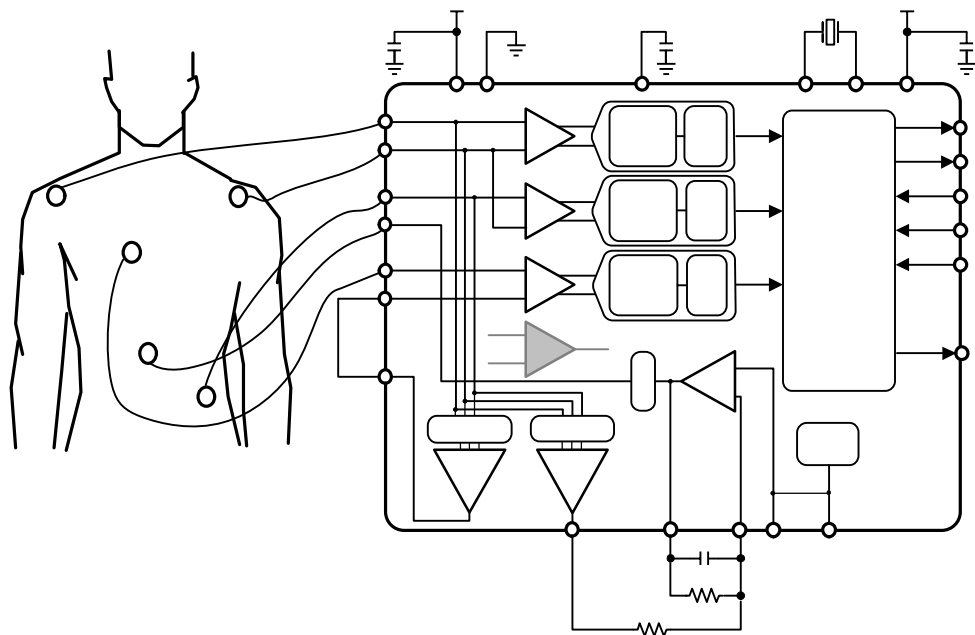


Figure 10: 5-Lead Application

- Open the ADS1293 software. On the upper left hand side of the GUI, under the “**Lead Configuration**” field, choose the “**5-Lead**” application.
- After the 3-lead application has been selected, the software will automatically change the registers for this application. To see what registers have been changed, click on the “**Register Map**” icon located on the upper left hand of the GUI (see image below).

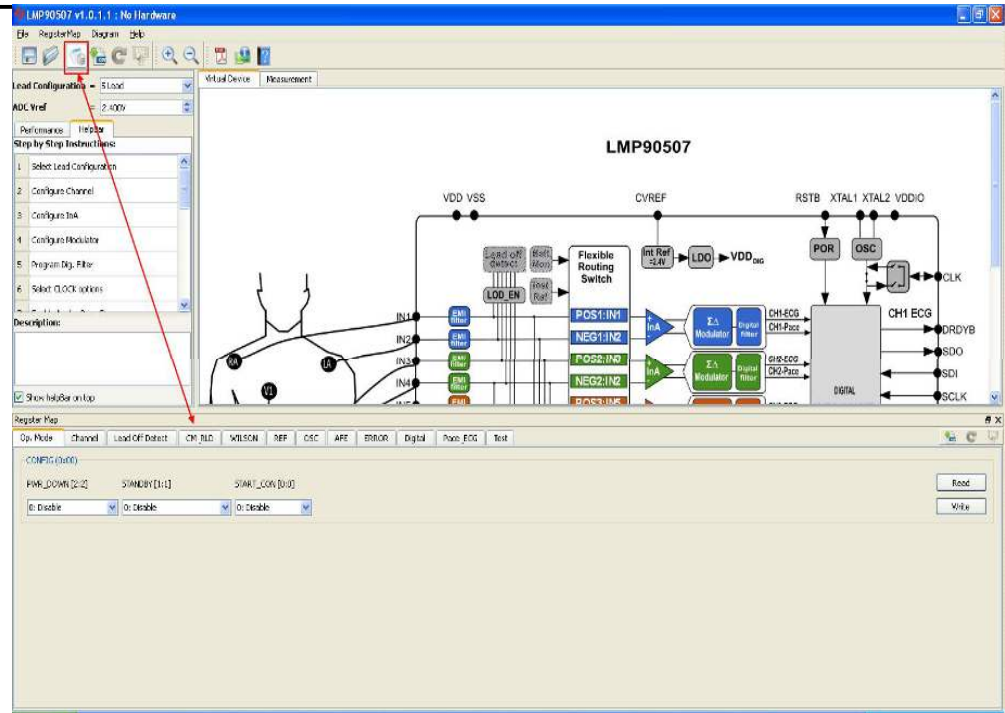


Figure 11: Register Map

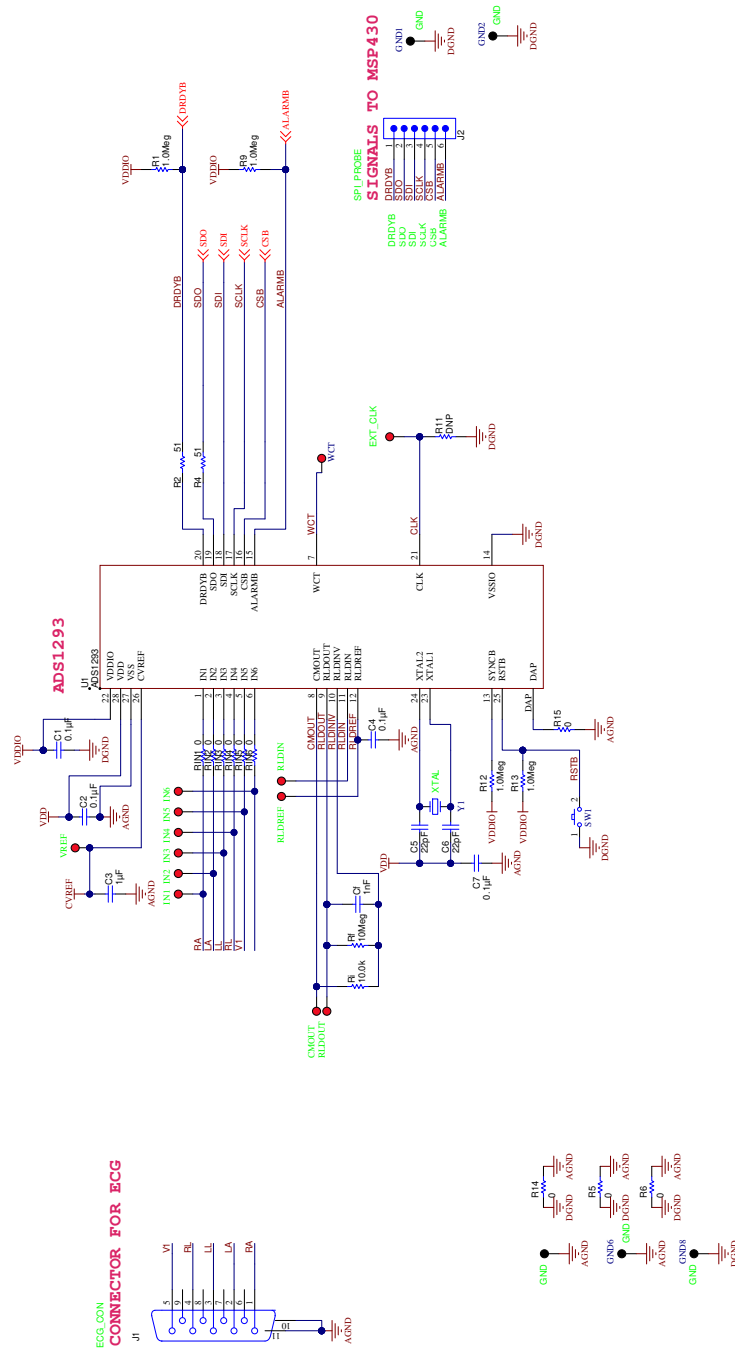
- Click on the **“Measurement”** tab and set the **Capture Mode** to **“run continuously”**. Click on the **“Run”** button to view the output voltage plot. An ECG reading for 3 channels should have been plotted (see image below).



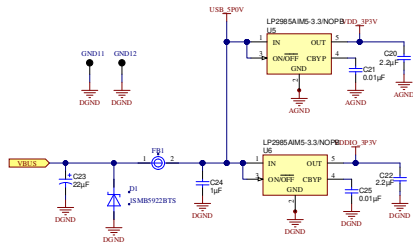
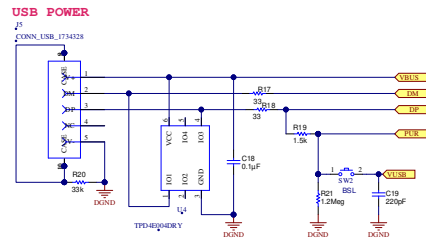
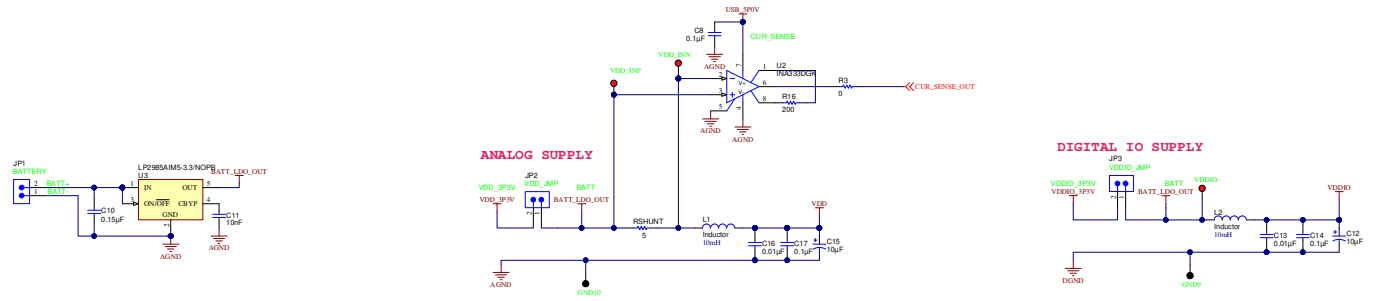
Figure 12: ECG Plot for 3-channels (5-lead) measurement

2.4. Schematic

The following figures show the schematic for the ADS1293EVM:



Setup



Setup

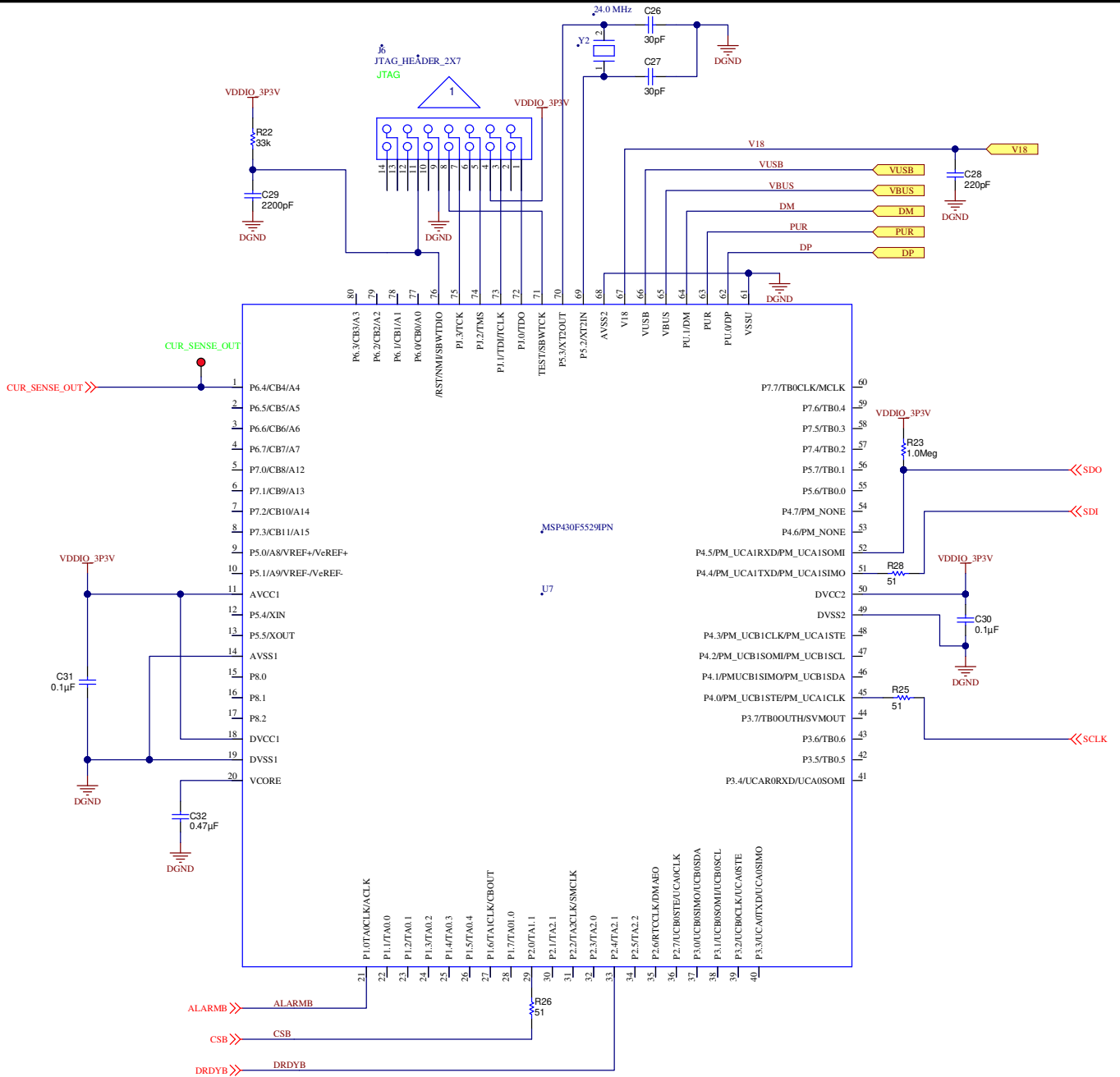


Figure 13: ADS1293EVM Schematic

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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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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.

REGULATORY COMPLIANCE INFORMATION (continued)**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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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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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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.

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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2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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Setup

NOTES

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No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

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