LMP93601 EVM User Guide

User's Guide

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LMP93601EVM User's Guide

Topic Page

1 General Description

This guide details the use of the LMP93601 evaluation module, LMP93601EVM (referred to as EVM for the remainder of this document).

The LMP93601 analog-front-end (AFE) is an Integrated Circuit (IC) for signal conditioning of thermopile sensors used in various applications. It can interface with thermopile occupancy detector arrays, thermopile flow sensors, and a range of transducers connected in a bridge configuration. The device contains a low power, low noise AFE consisting of a PGA and a16 bit delta-sigma analog-to-digital converter (ADC), with a SPI interface in an LLP-24 package.

The EVM facilitates evaluation of the integrated circuit shown in Figure 1. For more information on the LMP93601, refer to the datasheet: LMP93601 Low-noise 16-bit, 3-Channel AFE for Building Automation (http://www.ti.com/product/lmp93601).

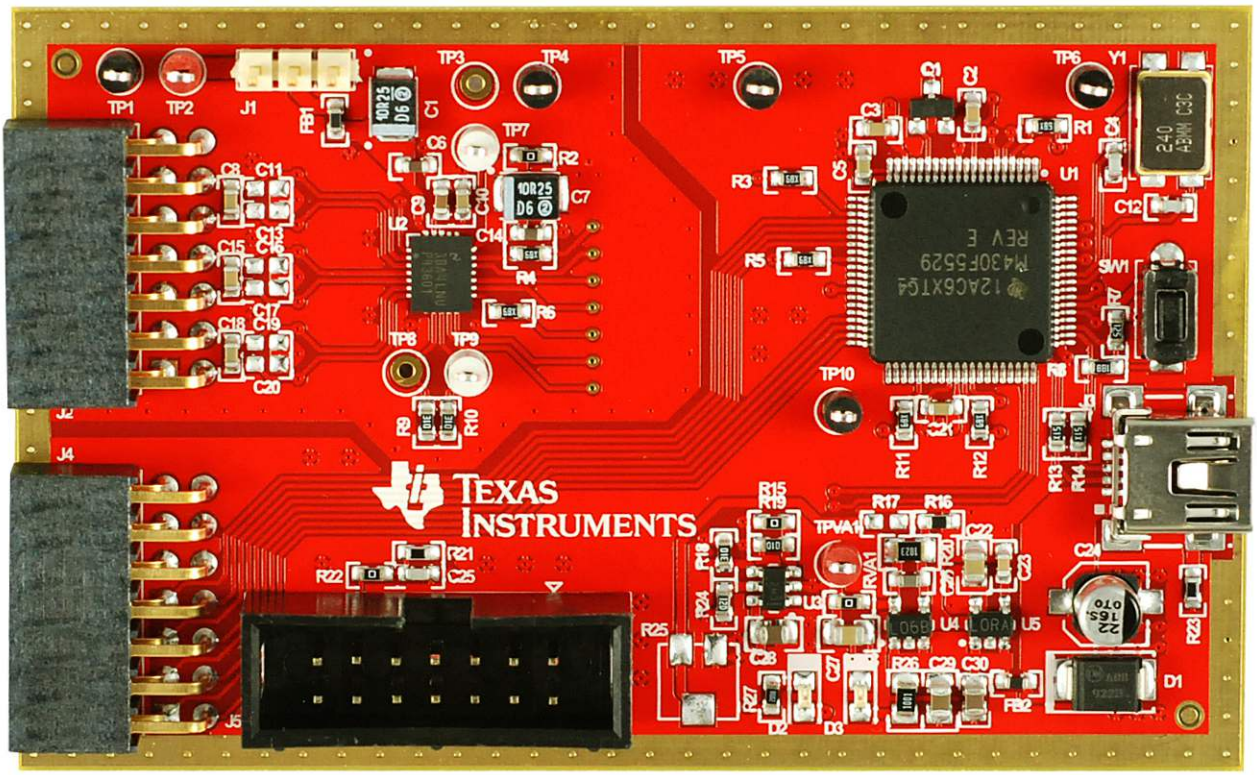


Figure 1. LMP93601 Evaluation Board

2 EVM Package Contents

The EK-LMP93601 evaluation kit comes with the following:

- The LMP93601 EK- evaluation board with:
  - On board MPS430 microcontroller
  - USB Mini-B to USB-A plug cable
- LMP93601 GUI software for host PC available for download from http://www.ti.com/product/lmp93601

3 Requirements for Using the EVM

The EVM interfaces to a host computer via USB interface as shown in Figure 2. The PC must be running Windows® 7 or Windows XP loaded with the LMP93601EVM-SW graphical user interface (GUI). The LMP93601 GUI can be obtained from the following site: http://www.ti.com/product/lmp93601.

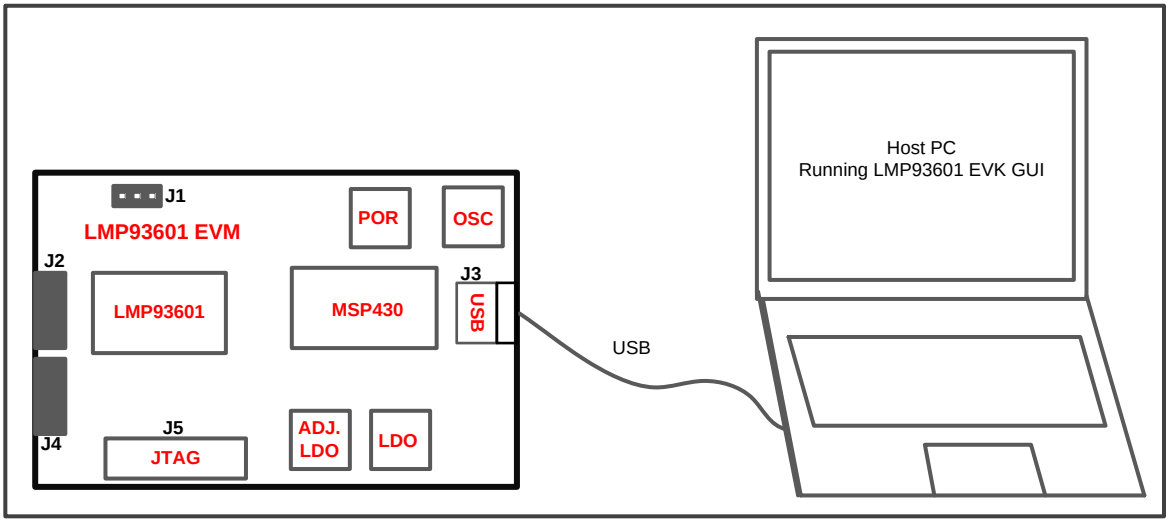


Figure 2. LMP93601 EVM Interface to a Host PC

4 Connection and Software Installation

This section describes the jumpers and connectors on the EVM, software installation, and how to properly connect, set up, and use the LMP9601EVM.

4.1

Table 1. Headers and Jumpers

Reference Designator	Name	Description
J1	AVDD_Select_JMP	AVDD source selection; internal LDO is connected if jumper is placed in position 1-2
J2	Analog inputs connector	Connection to protected AVDD source for external use; Connection to analog inputs; connection to MSP430 ADC_A0 and Vref.; Connection to the EVM board ground
J3	USB connector	USB to host PC connector
J4	GPIO connector	Connection to MSP430 to GPIO pins for external use; Connection to the EVM board ground
J5	JTAG interface	MSP430 JTAG interface

4.2 Software Installation

To ensure that you are using the latest version of LMP93601 software, download the software from our website at http://www.ti.com/product/LMP93601. You must install the software before you connect the LMP93601EVM to your PC.

Step 1. Log onto http://www.ti.com/product/LMP93601, then scroll down to the “Software” section to download the latest version of the LMP93601 software package into a known local directory

Step 2. UnZip the downloaded file into the local hard drive and click to open the created subdirectory. Click on the “setup.exe” to install the software in the host computer

Step 3. Connect the EVM board via the USB cable included in the package to the host PC

Step 4. Click on Start tab, to open the “All programs” menu. Click on “Texas Instruments” subdirectory as shown in Figure 3.Then, on the LMP93601 subdirectory. Click on the “LMP93601 GUI” (see Figure 3) to run the program in the host PC.

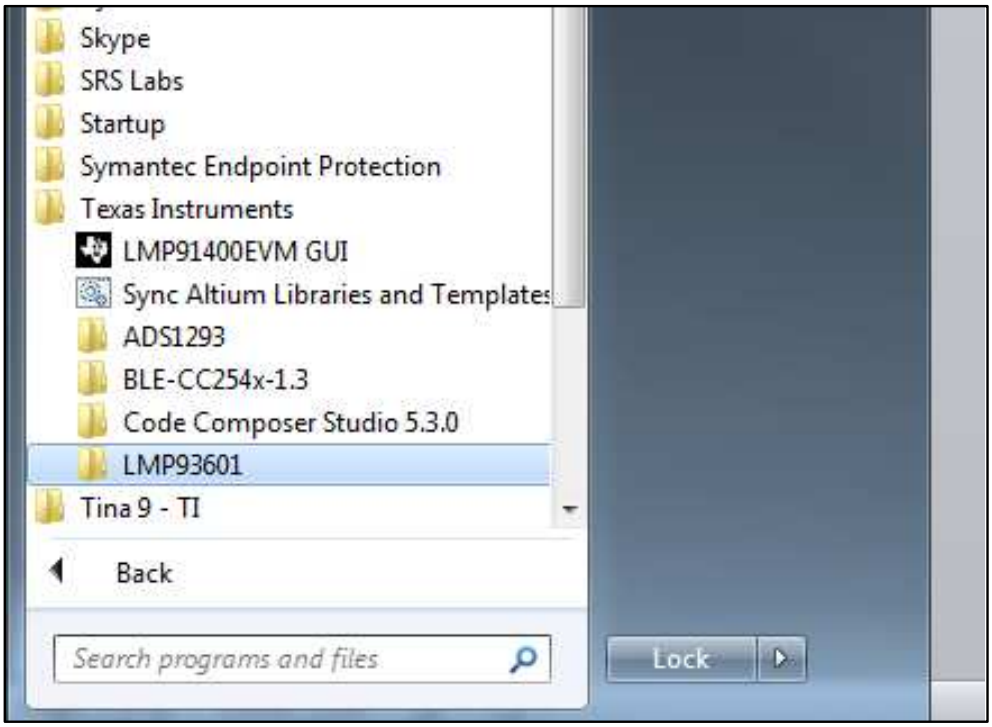


Figure 3. The LMP93601 GUI Installation

Step 5. Make sure the included USB cable is connected to the host PC and the LMP93601EVM. Next, select the communication port on the host PC by looking up the allocated port in the device manager. To open the "Device Manager" in MS Windows, click on the "Start" tab, then on the "Control Panel". In the Control Panel window, locate the "Device Manager" tab, and click on the tab to open it. Click on Ports (COM&LPT) to identify the allocated communication port in the host in the host PC as shown in Figure 4.

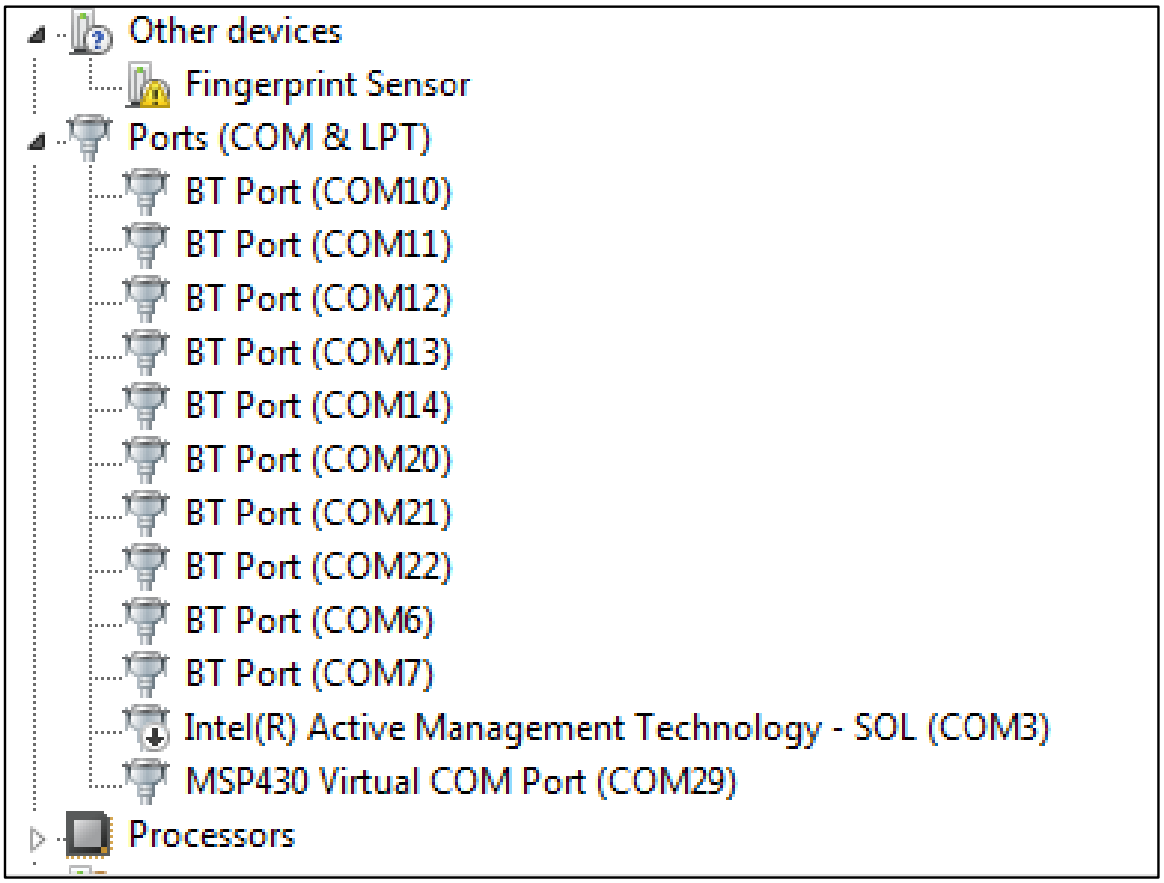


Figure 4. Determining which Port is Assigned by Windows in the Host PC for Communication to the LMP93601

Step 6. In the “Main tab” display mode in the LMP93601 GUI, select the “PortCOM” identified in step 5 and then Click on connect tab and the display as shown in Figure 5.

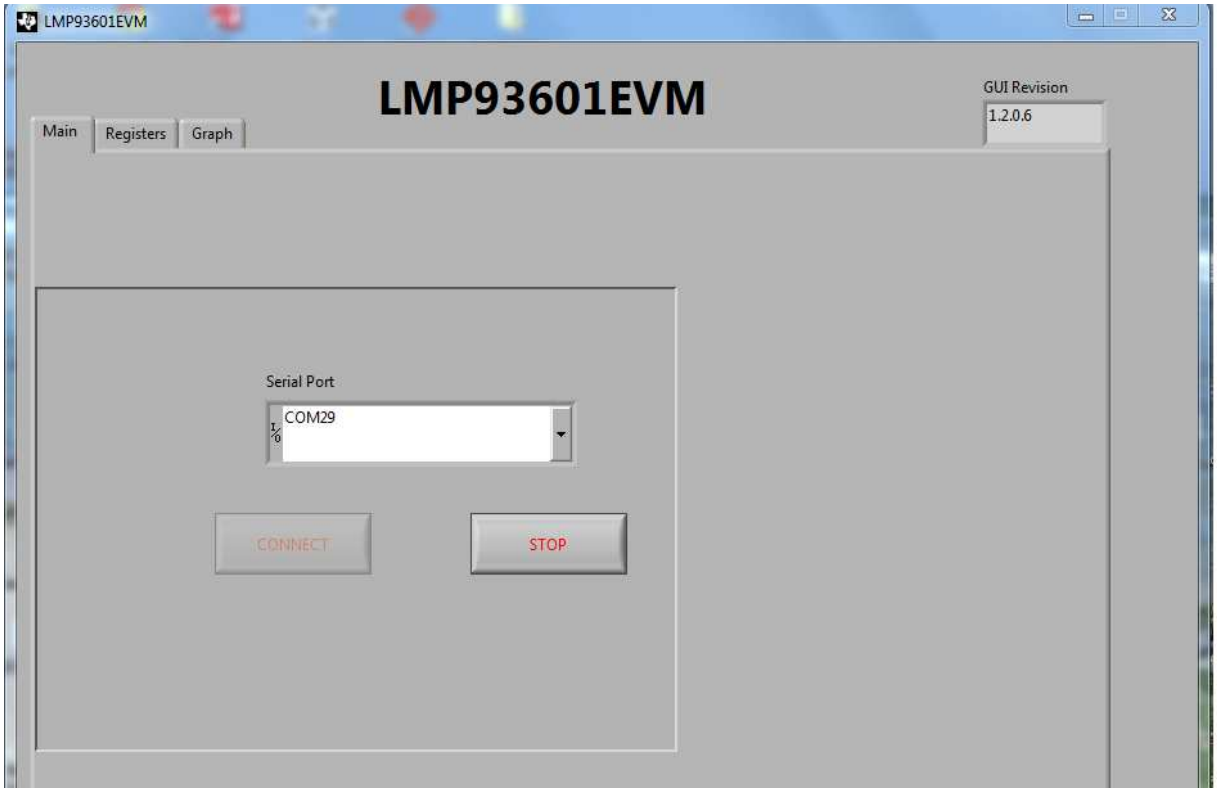


Figure 5. GUI Communication Port Selection

If the correct COM port has been selected after clicking on the “Connect” tab, at the bottom of the display the message “connection successful will be displayed as shown in Figure 6.

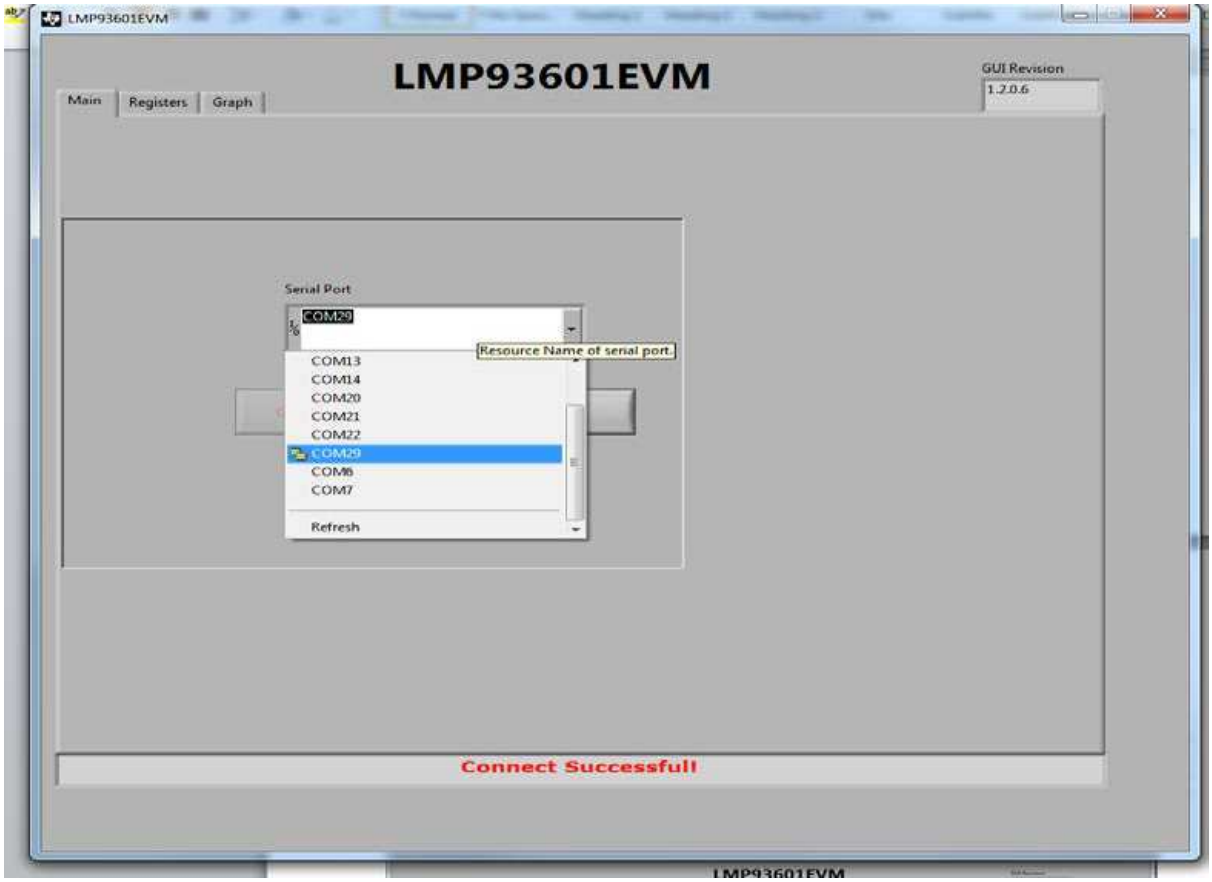


Figure 6. Successful Connection to the LMP93601 EVM

5 The LMP93601 GUI Menus

The LMP93601 EVB GUI provides a simple interface to the EVM board for quick evaluation of the features of the LMP93601 AFE. The GUI provides three display Windows (selectable by clicking on the appropriate tabs): “Main”, “Registers”, and “Graph”. The tabs are located at the top of the display window. The default display upon the execution of the software is the “Main” and shown in Figure 6.

6 Register Menu

The register menu is displayed by clicking on the “Register” tab as shown in Figure 7. In this menu, the LMP93601 user registers are available for various settings.

To see the options in each register window, place the cursor in the desired register window and left clicking in this position, the list of possible options will be displayed as shown in Figure 8. Just move the curse to the option and click to select.

To program the registers, the device has to be in unlock state (select “Config Writable” in the Lock pull-down window).

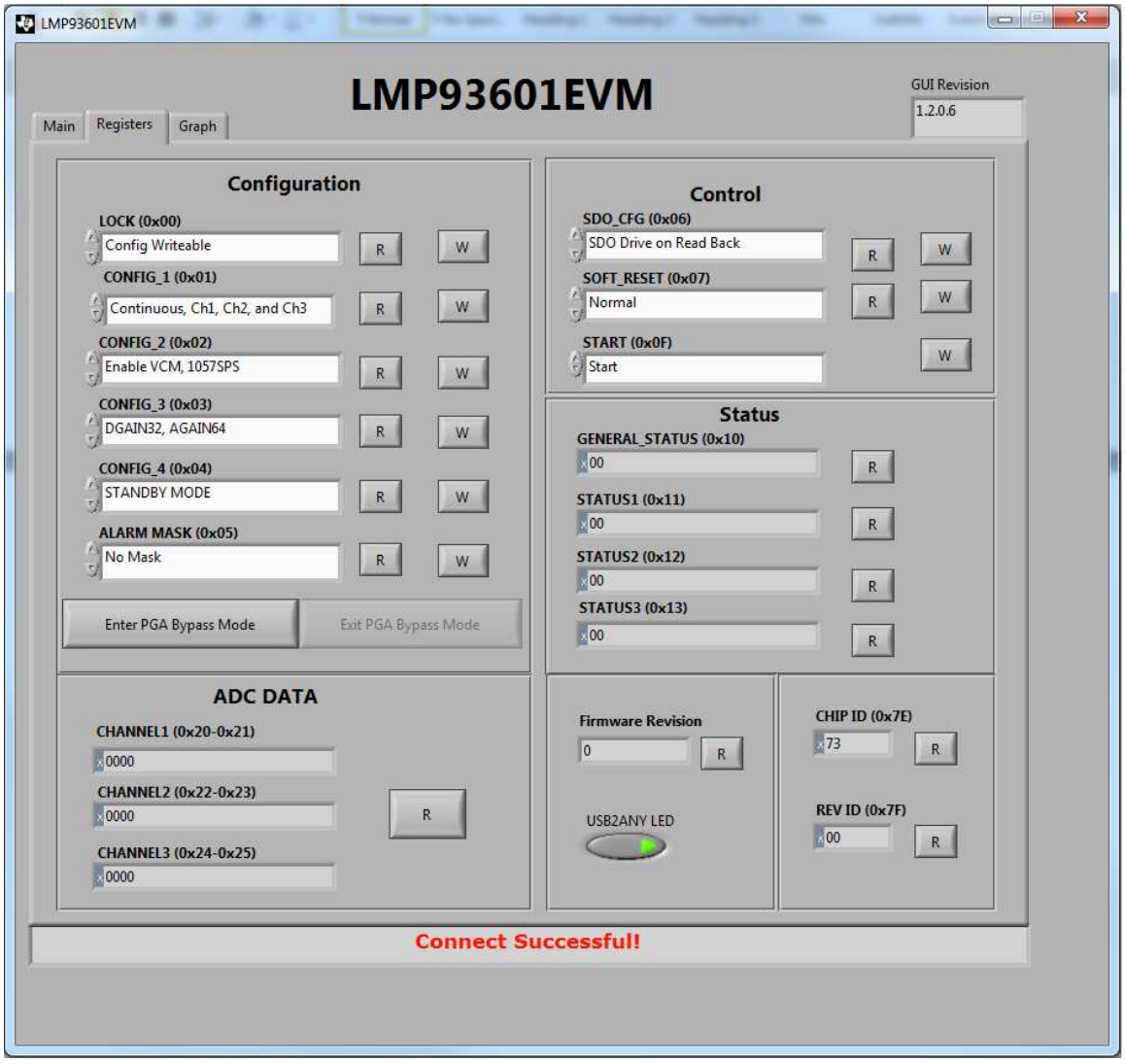


Figure 7. Register Menu

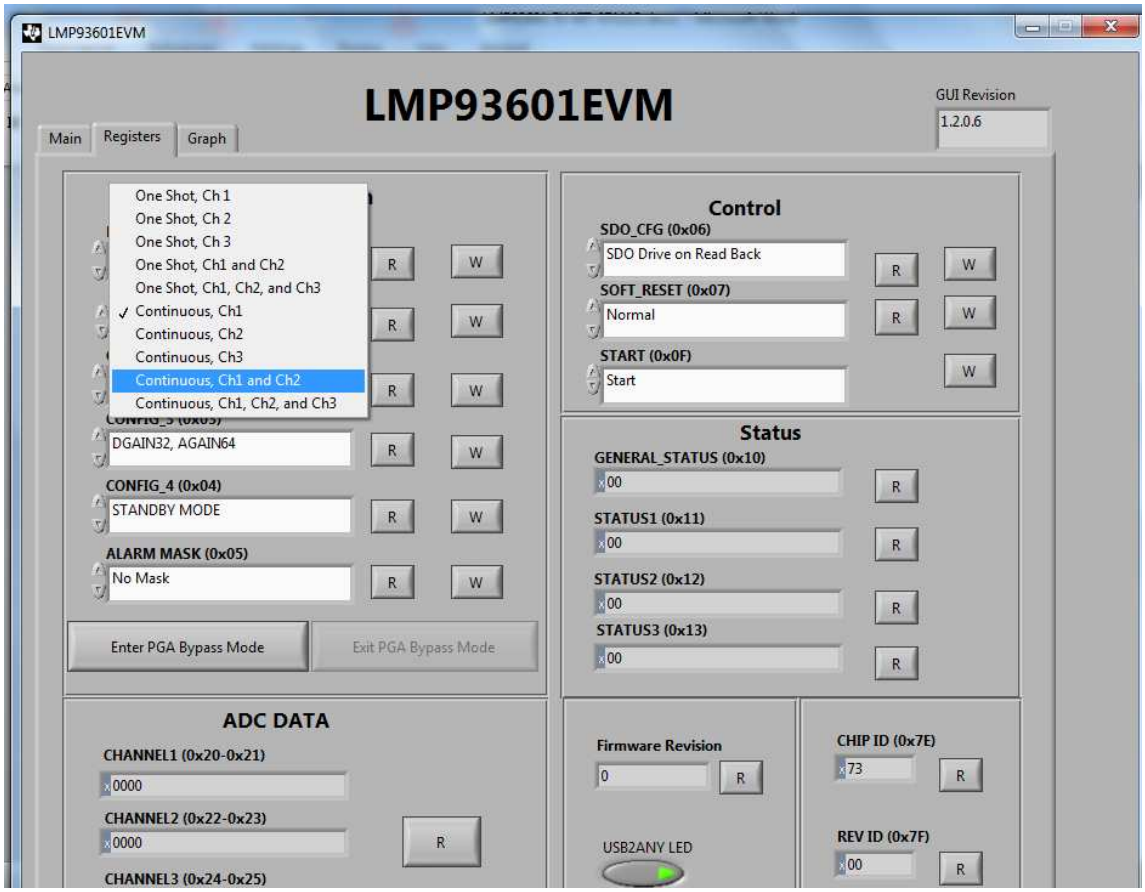


Figure 8. Selecting an Option in a Register Pull-Down Window

7 Graph Display Menu

The “Graphic” display menu includes there windows for displaying the outputs of the three multiplexed channels of the LMP93601 as shown in Figure 9,

To Display the outputs after setting the device for a specific mode of operation in the Register window, click on the “Start Graph” button. You can stop the GUI from displaying the outputs by pressing the “Stop Graph” button at any time.

Additional display options can be selected by placing the cursor in the graph display area and right clicking to display the drop-down menu as shown in Figure 10.

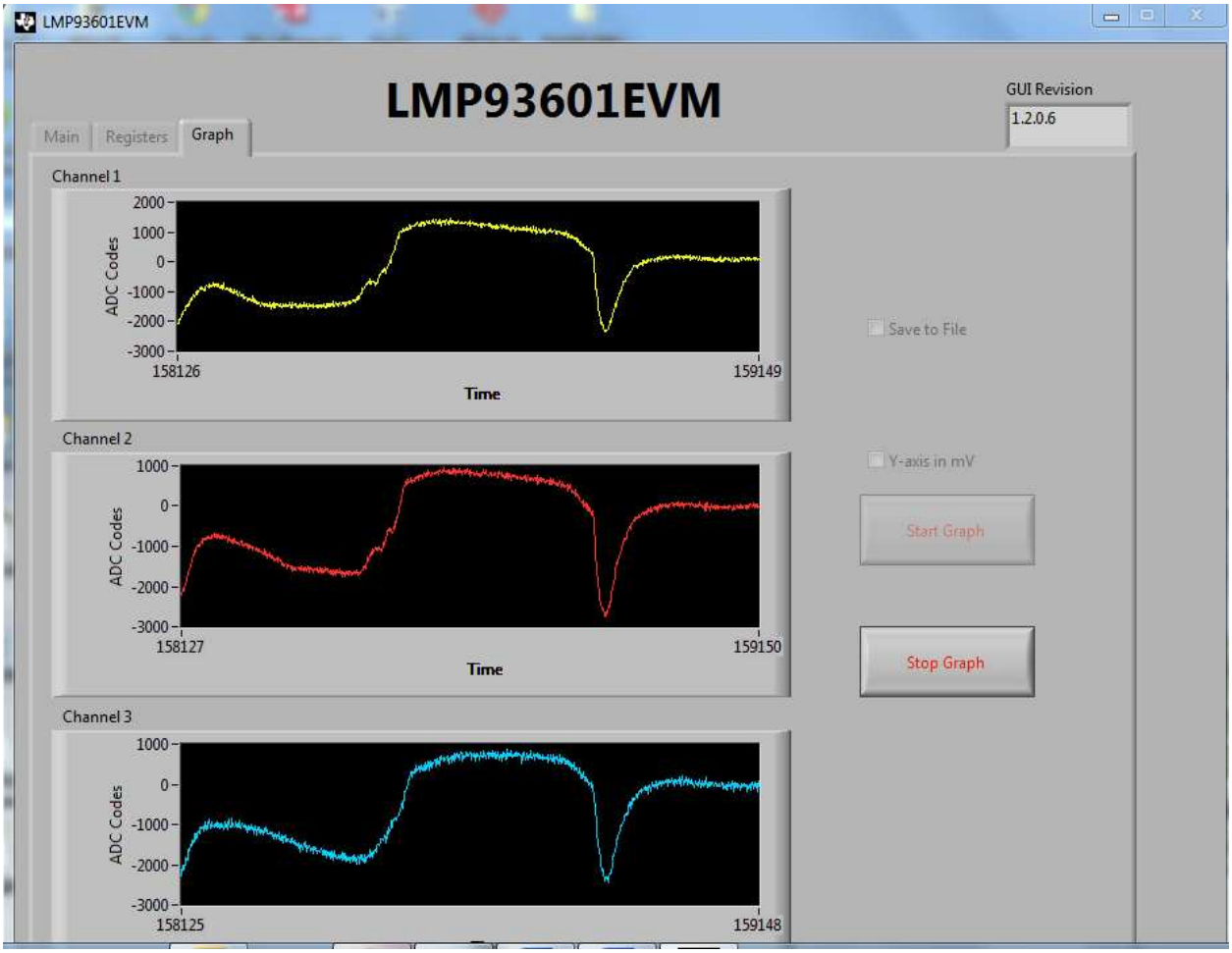


Figure 9. Graph Display Showing The Outputs of the Three MUXed Channels

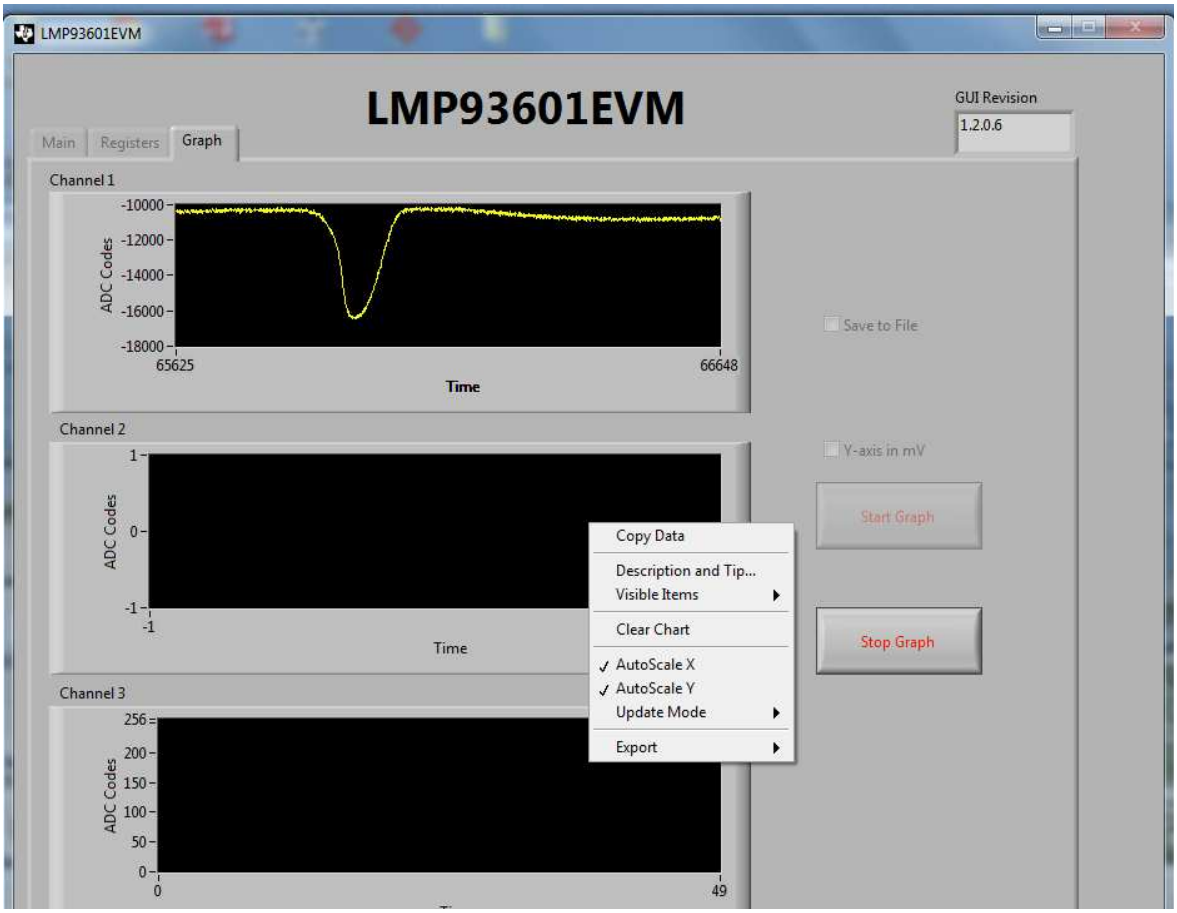
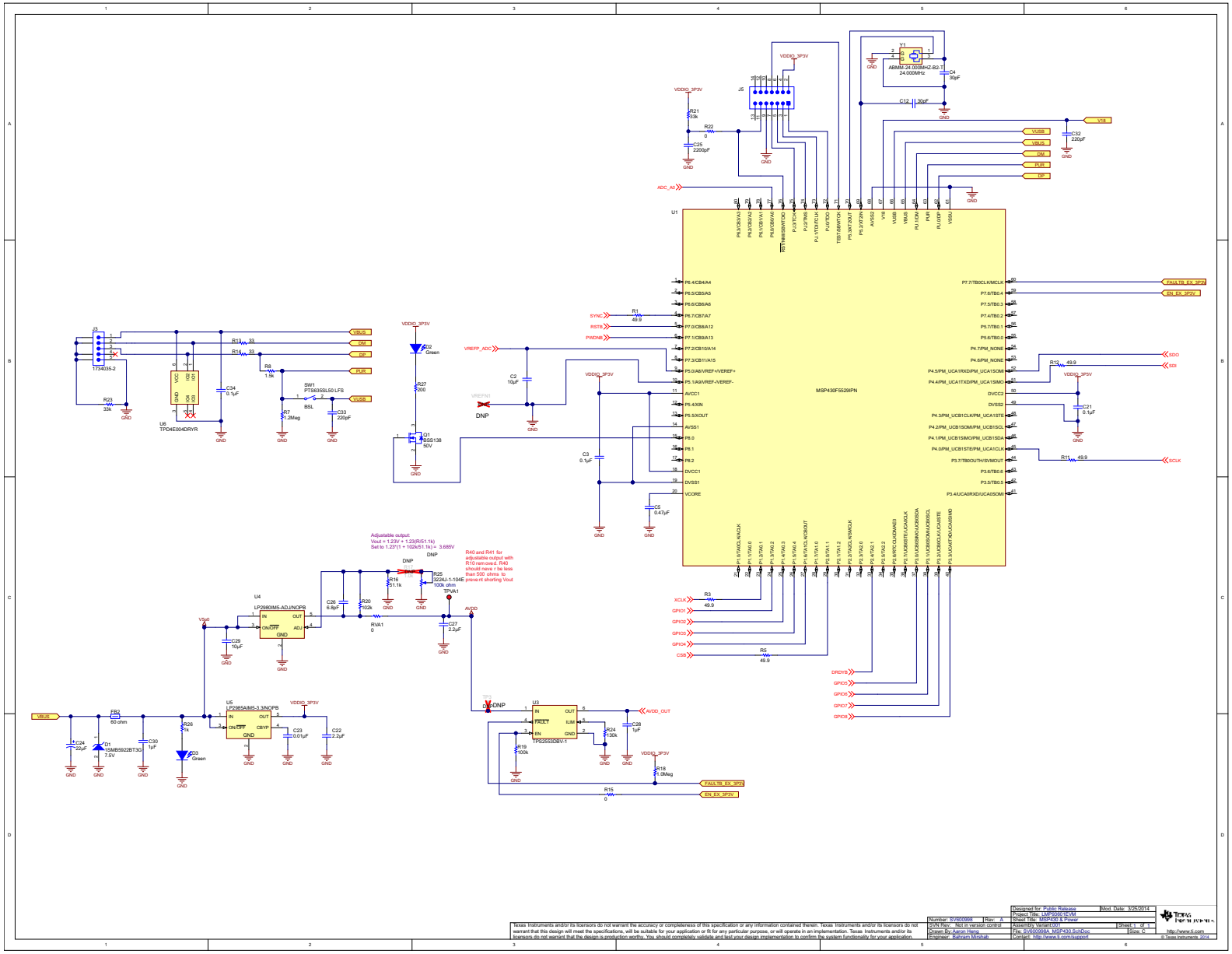
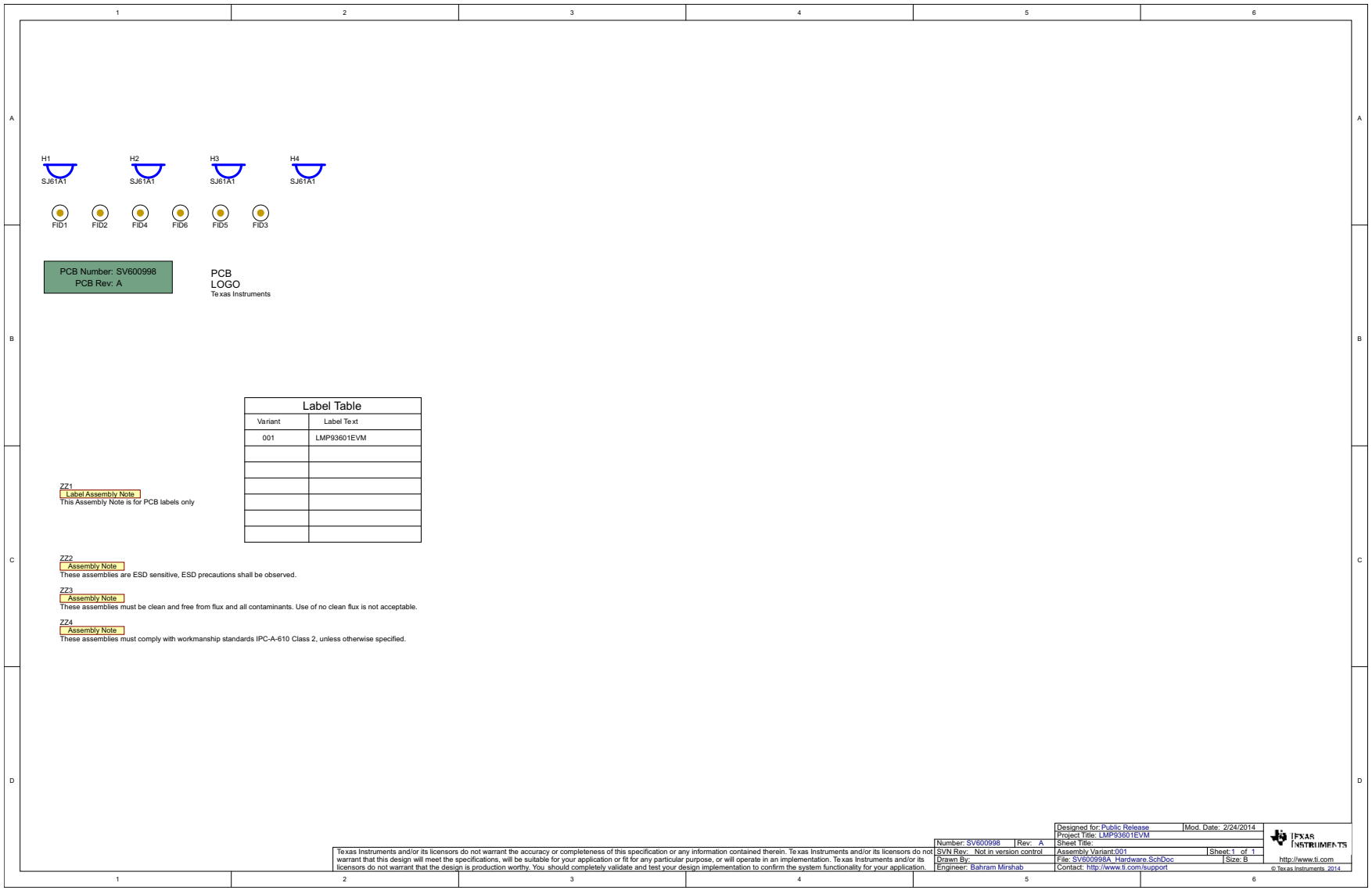
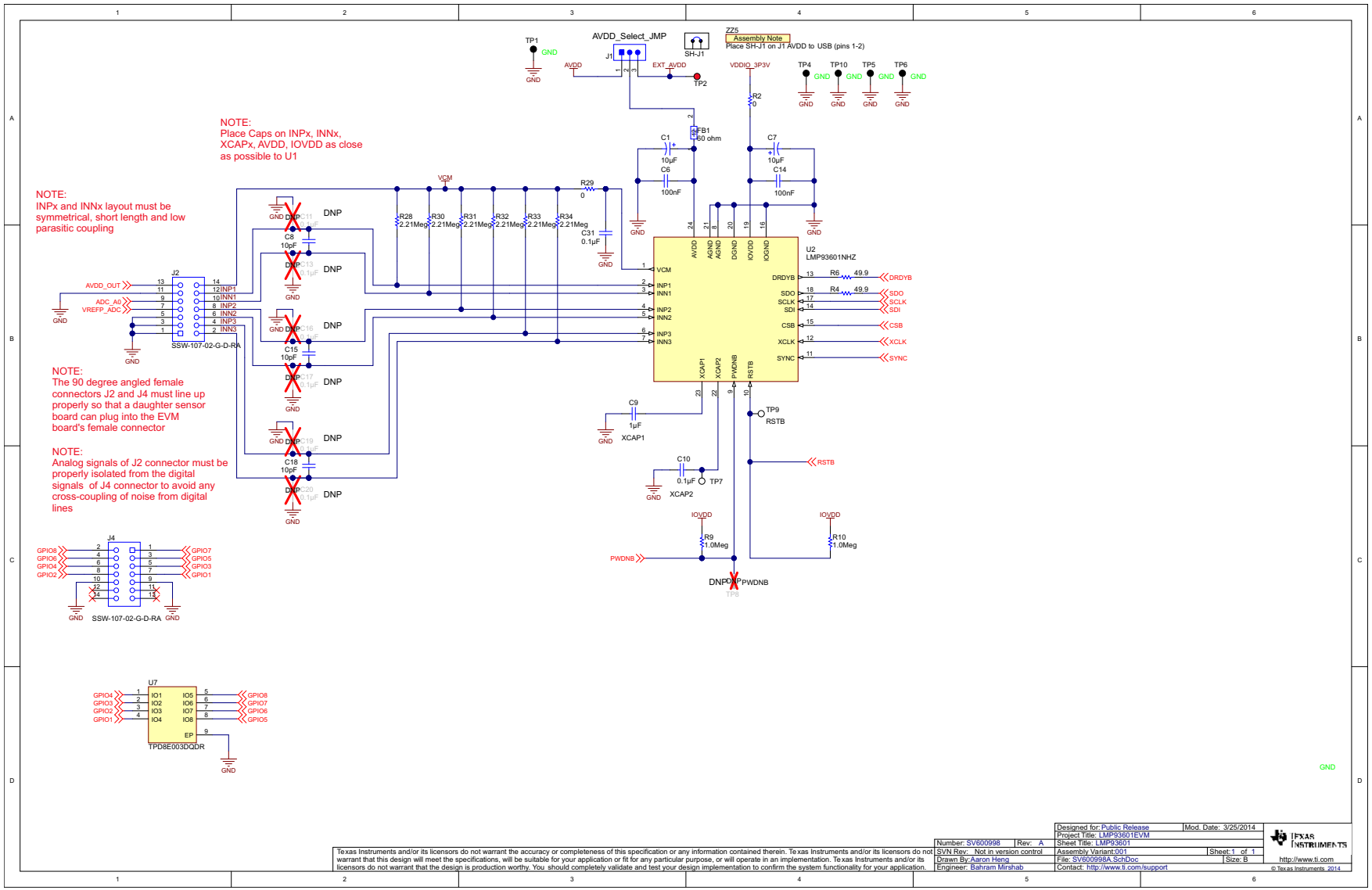


Figure 10. Drop-Down Menu Enable Set Auto Scaling

8 Schematic Diagrams







9 Revision History

DATE	REVISION	NOTES
March 2014	*	Initial release.
March 2014	A	Updated schematic images.

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      3.1.1 *Notice applicable to EVMs not FCC-Approved:*

      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*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). 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

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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

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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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.

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