

# ISL26104AV28EV1Z Evaluation Board User Guide

## General Description

The ISL26104AV28EV1ZA provides a means to evaluate the functionality and performance of the ISL26104 A/D converter.

The board includes an AT90USB162 microcontroller with a USB interface. The microcontroller interfaces to the ISL26104 ADC via a galvanically-isolated interface and provides serial communication via USB between the board and the PC.

Software for the PC provides a GUI (graphical user interface) that allows the user to configure the ISL26104 device and to perform data capture, and to then process and plot the results in the time domain, as a histogram, and/or to perform frequency domain analysis on the captured data. The GUI also enables the user to save conversion data from the ADC to a file, or to save the results of the analyzed conversion data.

## Key Features

- ADC is galvanically-isolated from USB connection
- On-board microcontroller
- On-board voltage reference
- Evaluation software
  - Time domain analysis
  - Noise histogram analysis
  - FFT analysis

## Ordering Information

PART NUMBER	PACKAGE (Pb-free)
ISL26104AV28EV1Z	Evaluation Board

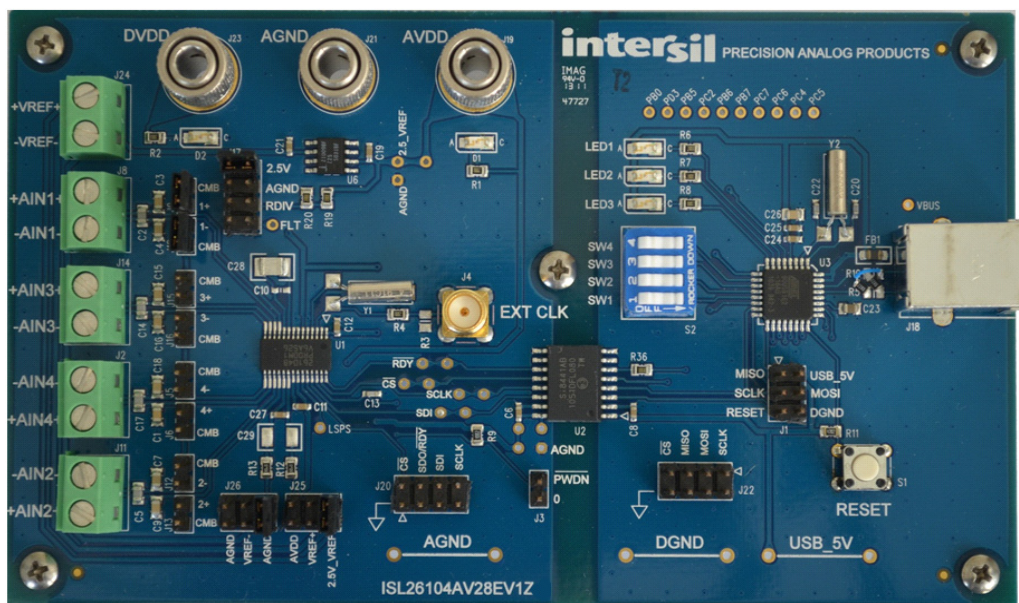


FIGURE 1. EVALUATION BOARD FOR THE ISL26104

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## Hardware

The ISL26104AV28EV1Z evaluation board provides the user a means of evaluating the ISL26104 Analog-to-Digital Converter (ADC). The ISL26104 is a high performance 24-bit ADC that includes a very low noise programmable gain amplifier. The ISL26104 offers multiple gain selections: 1x, 2x, 4x, 8x, 16x, 32x, 64x and 128x. It offers 20 word rate selections from 2.5Sps to 4000Sps (clock = 4.9152 MHz). Gain and word rate selections are made by writing into on-chip registers.

The board comes with an ISL26104 soldered in place. This can be removed and an ISL26102 soldered in its place if desired.

## Evaluation Board Overview

The ISL26104AV28EV1ZA evaluation board is segmented into two sections. These sections are galvanically-isolated with a multi-channel isolation chip. The two different sections of the board can be readily identified in Figure 1, which shows an image of the board. The ISL26104 ADC and its associated circuitry (voltage reference and input signal components) are on the left side of the image. The ADC and its associated circuitry are powered by a laboratory supply. The microcontroller with its USB interface is on the right side of the image in Figure 1. This circuitry is powered from the USB connection. See Figure 2 for a block diagram of the circuitry. The microcontroller provides the USB interface to the PC. A software GUI is available to communicate with the microcontroller and provides the means to collect and analyze data from the ADC.

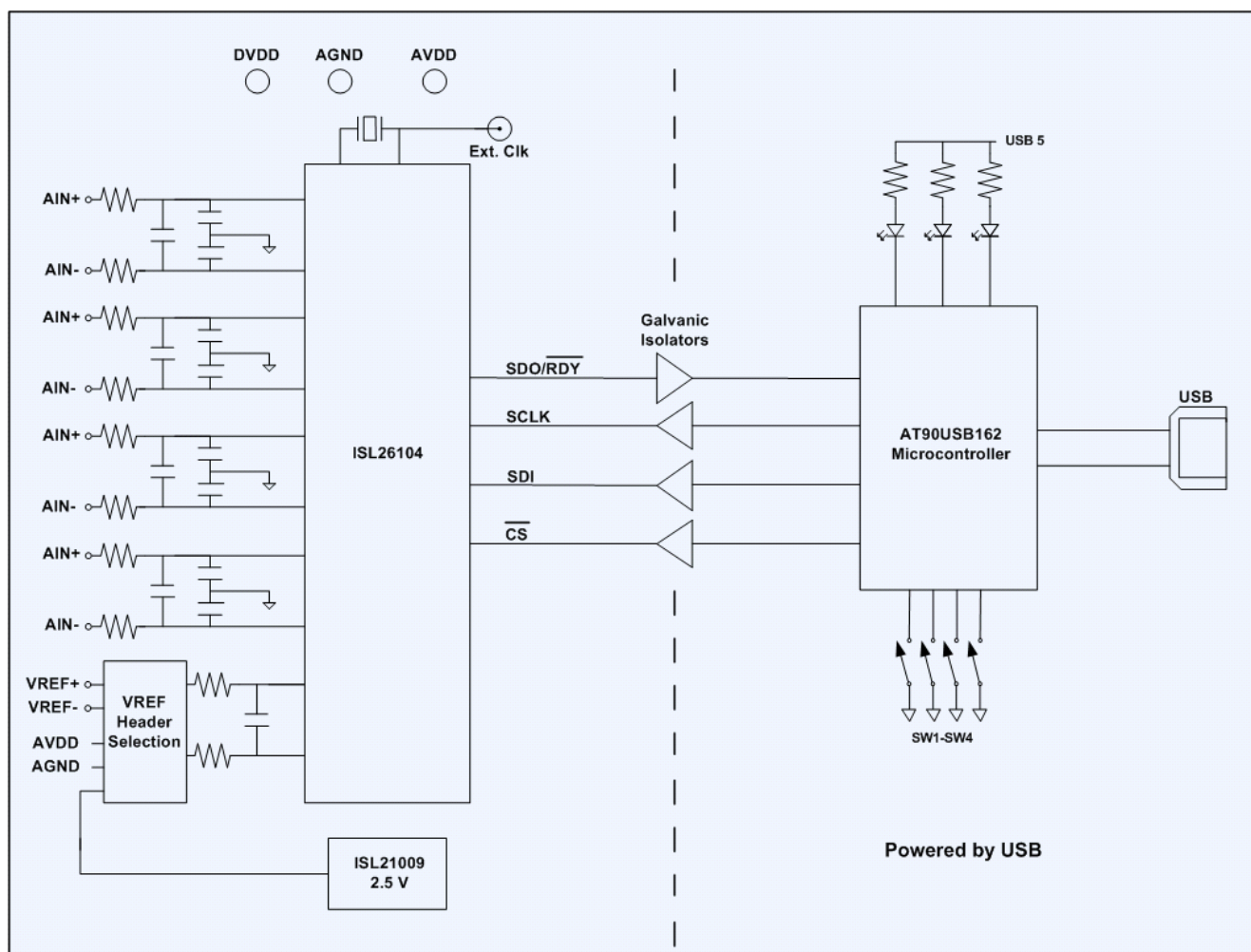


FIGURE 2. BLOCK DIAGRAM OF THE EVALUATION BOARD FOR THE ISL26104

## Galvanic Isolation

Galvanic isolation is not necessary in every application. The purpose of the isolation on the evaluation board is to prevent noise from the USB ground connection from affecting the sensitive measurements made by the ADC when used in the 64X or 128X gain settings. The ground connection of the USB cable in most computers is referenced directly to the power supply ground of the computer. This ground can be especially noisy in notebook PCs powered from an external power module. Operating the ADC on a power system that is galvanically isolated from the USB ground ensures that the performance of the ADC on the evaluation board will not be affected by ground noise from the PC being used to collect data from the board.

## ADC Section

The ADC section of the evaluation board has three banana jack power connections that enable this portion of the board to be powered from a low noise laboratory supply. The banana jack labeled AGND serves as the power supply ground connection for the ADC segment of the board. The DVDD jack supplies the

digital portion of the ADC (3.3V to 5V) and the section of the galvanic isolation chip that interfaces to the ADC. The AVDD jack supplies the analog portion of the ADC and the voltage reference. The voltage reference used in the ADC circuitry is an Intersil ISL21009BFZ25 2.5V reference. A header is provided to also allow the use of an external voltage reference for the ADC. The ADC portion of the circuitry on the board is illustrated in Figure 3.

The ISL26104 offers several sample rate, gain, and input channel options. These options are selected using on-chip registers that can be written by the PC GUI software. When a command to change the gain, the rate, or the multiplexer channel is issued by the GUI, the command is sent over the USB connection to the microcontroller on the evaluation board. The microcontroller then writes into the proper ADC register via the serial port using the  $\overline{CS}$ , SDI, SDO/ $\overline{RDY}$  and SCLK signals which are connected to the ADC from the  $\mu C$  through the isolation chip as shown in Figure 4.

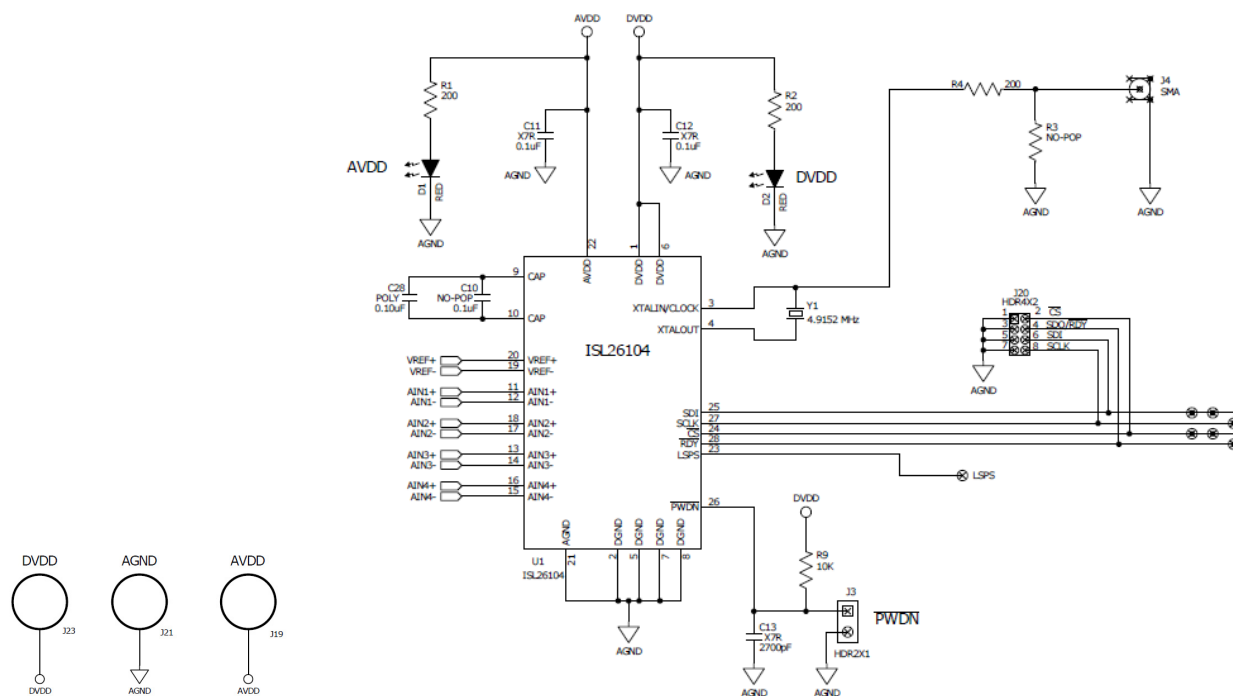


FIGURE 3. ISL26104 ANALOG-TO-DIGITAL CONVERTER

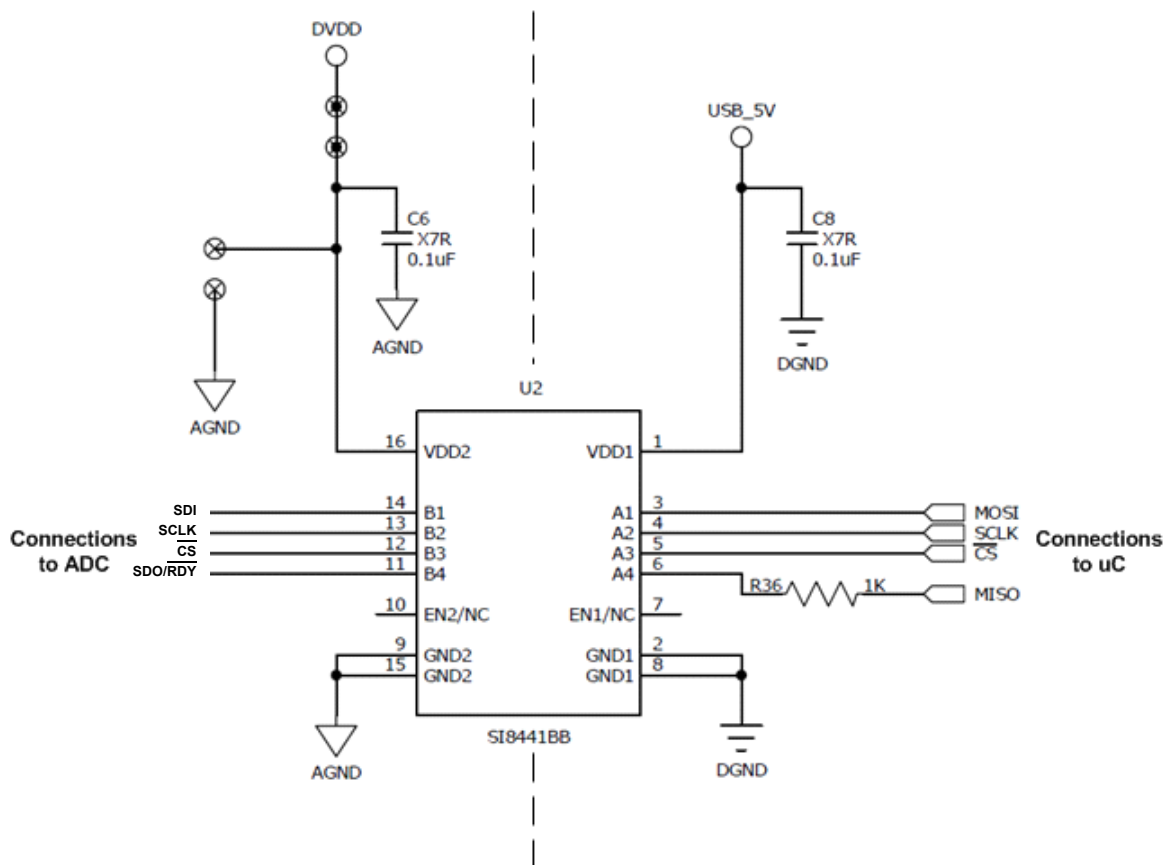


FIGURE 4. GALVANIC ISOLATOR CHIP

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The ADC uses a 4.9152MHz crystal operating with an on-chip amplifier for its clock source. This can be disconnected and an external clock can be sourced to drive the clock input to the chip. Alternately, the XTALIN/CLOCK pin can be grounded and the ADC will operate from an on-chip RC type oscillator.

The board provides a 2.5V reference IC as the voltage reference for the ADC, as shown in Figure 5 or, an external voltage can be

connected to input terminals on the board (VREF+ and VREF-) and selected through jumpers on headers J25 and J26 to provide a reference voltage for the ADC as shown in Figure 6. These headers also provide the option of selecting AVDD and AGND as inputs to the VREF+ and VREF- on the ADC.

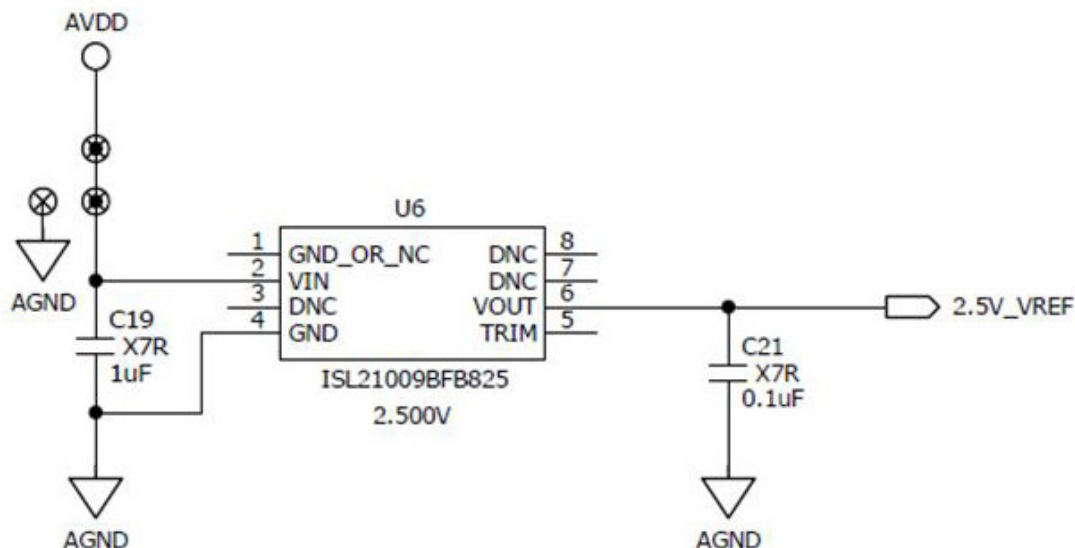


FIGURE 5. 2.5V REFERENCE

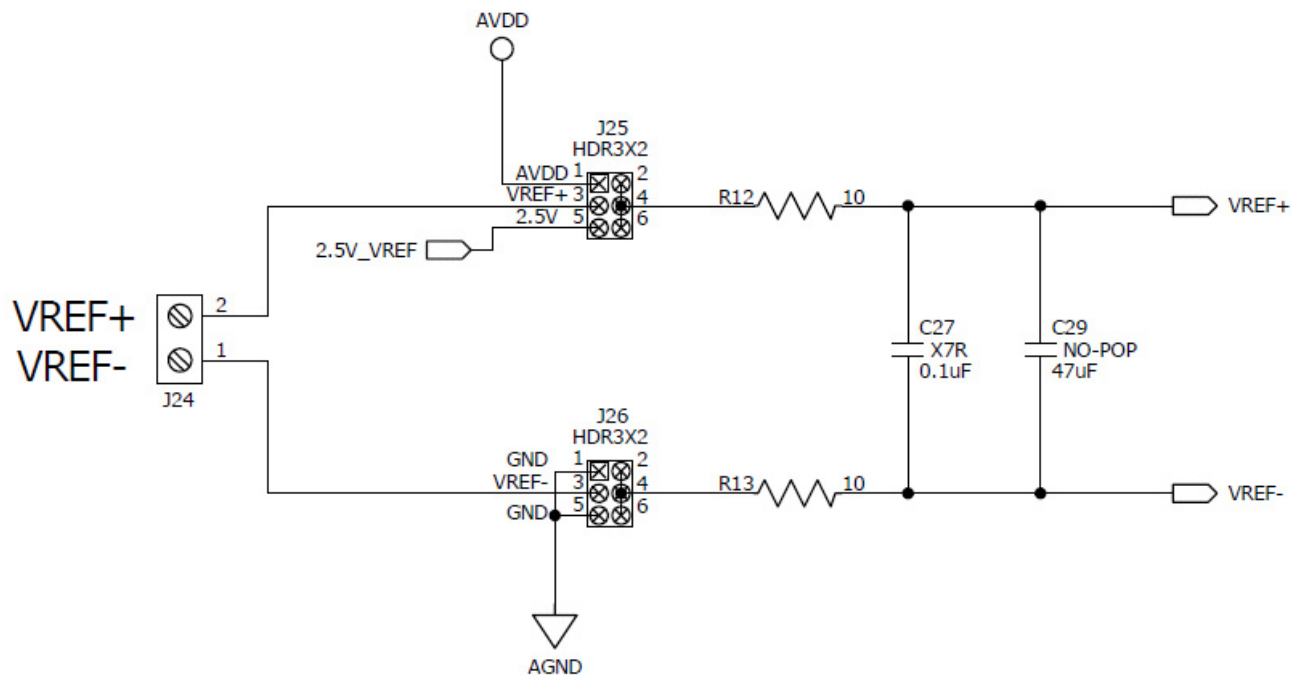
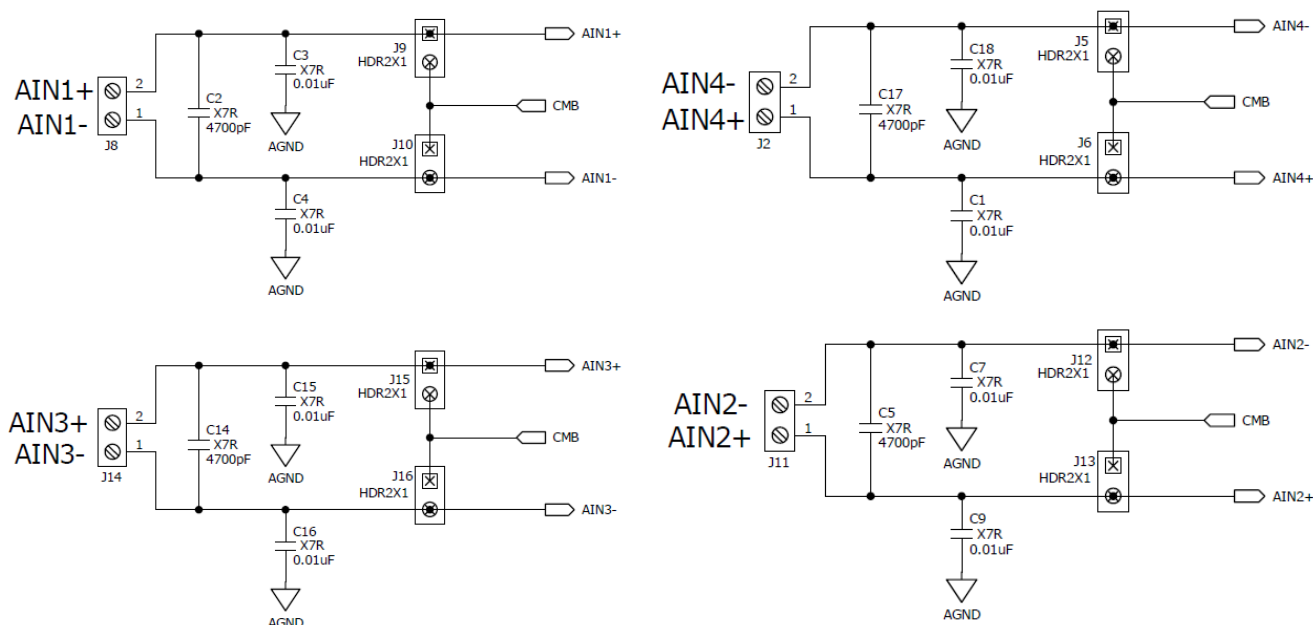


FIGURE 6. VOLTAGE REFERENCE SELECTION OPTIONS

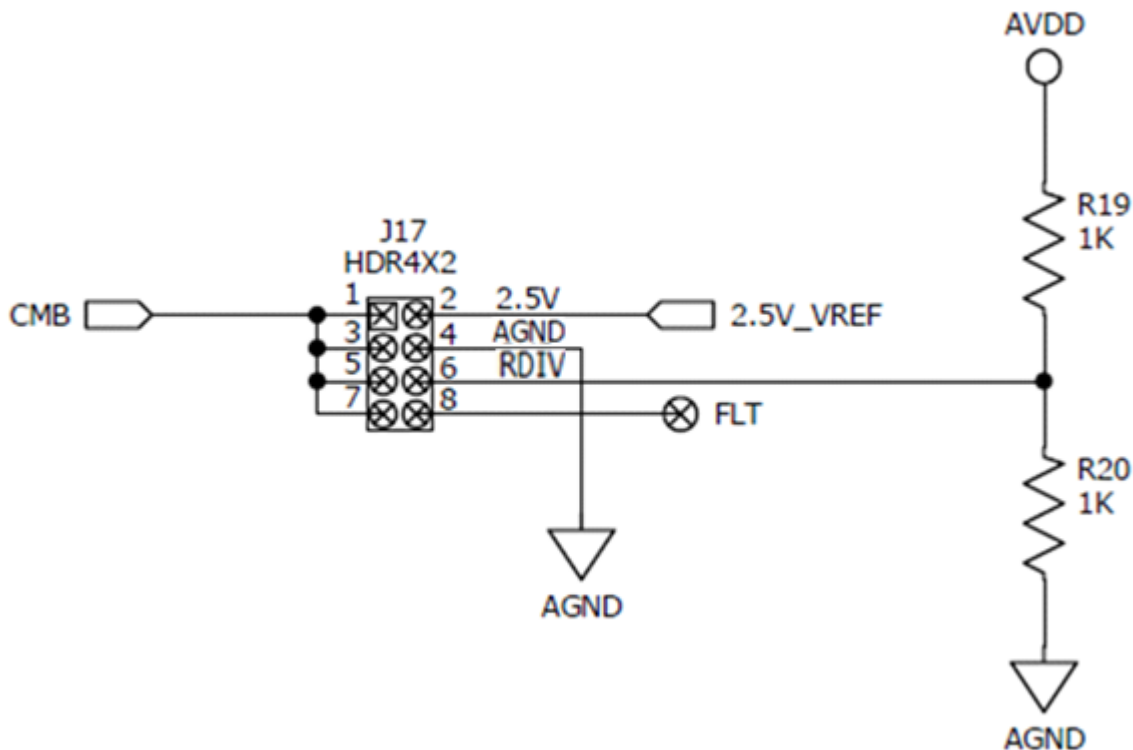
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The evaluation board provides separate terminal connections for each of the differential signals into the ADC. These terminals are shown in Figure 7. Be attentive of the labeling of the connections and their polarities when connecting external

signals. The channel numbers on the terminal blocks are not in numeric order and some have their polarities labeled opposite of others.



### FIGURE 7. ANALOG INPUTS



**FIGURE 8. COMMON MODE SELECTIONS**



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Header connector J17 in Figure 8 allows the user to select one of the following options for the common mode bias (CMB) voltage: the 2.5V voltage reference output, ground (AGND), a voltage generated by a resistor divider (RDIV) that divides the AVDD supply using two 1k $\Omega$  resistors, or a voltage determined by the user which must be connected to the hole next to the header connection labeled FLT (Floating Input). The voltage source which is selected by header J17 is provided to the analog input channels as a common mode bias voltage (CMB).

Each of the input channels has jumpers (for example, J9 and J10 for input AIN1 in Figure 7) to allow the user to connect the common mode bias (CMB) voltage to either the AIN+ or the AIN- input of the channel. This enables the external signal source to be biased to a common mode value supplied by the board. If both jumpers are put in place, and the analog inputs to the terminals are left disconnected, the inputs to this particular AIN channel of the ADC will be shorted to the common mode voltage. This provides a means for testing the noise performance of the ADC with both of its inputs (AIN+ and AIN-) shorted to a common mode voltage.

The ADC interfaces to the microcontroller through the galvanic isolators. The ADC side of the isolator chip is powered by the same supply that powers the DVDD supply of the ADC.

## The Microcontroller Section

Figure 9 illustrates the microcontroller circuitry. There is a reset button provided but it is seldom necessary to use it. The microcontroller has its own power-on reset which will initialize the microcontroller when the USB interface is connected to a powered PC. Power for the microcontroller section comes from

the USB interface. The microcontroller circuit includes a DIP switch, some LEDs and two header connectors.

The board is shipped from the factory with the four switches of the DIP switch set to the OFF position. This is required for normal operation. Other switch positions are used at the factory to troubleshoot the isolator interface if the board is not functioning properly. These switch positions are not useful for normal board application, therefore all the switches should be kept in the OFF position.

The three LEDs will illuminate when the USB interface is plugged in and actively powered. Some of the LEDs blink when the microcontroller is passing a command to the ADC or when data is being collected from the ADC.

The microcontroller section includes two headers. Header J11 is a six pin connection used to program the flash in the microcontroller. Header J22 provides access to the four signals that are used by the microcontroller to interface to the ADC. If desired, the customer could remove the isolator chip from the board and use header J22 to connect into his own circuitry to his ADC. This enables the customer to use the PC GUI software to evaluate the ADC in the customer's system. An alternate method of connection is to remove the ISL26104 device from the board and connect into the customer circuit via the signals on header J20. If this method is chosen, the customer would need to power the ADC side of the isolator chip from his system (3V to 5V).

The microcontroller communicates with the ADC via the galvanic isolator chip. The microcontroller side of the isolator is powered by the voltage from the USB connection.

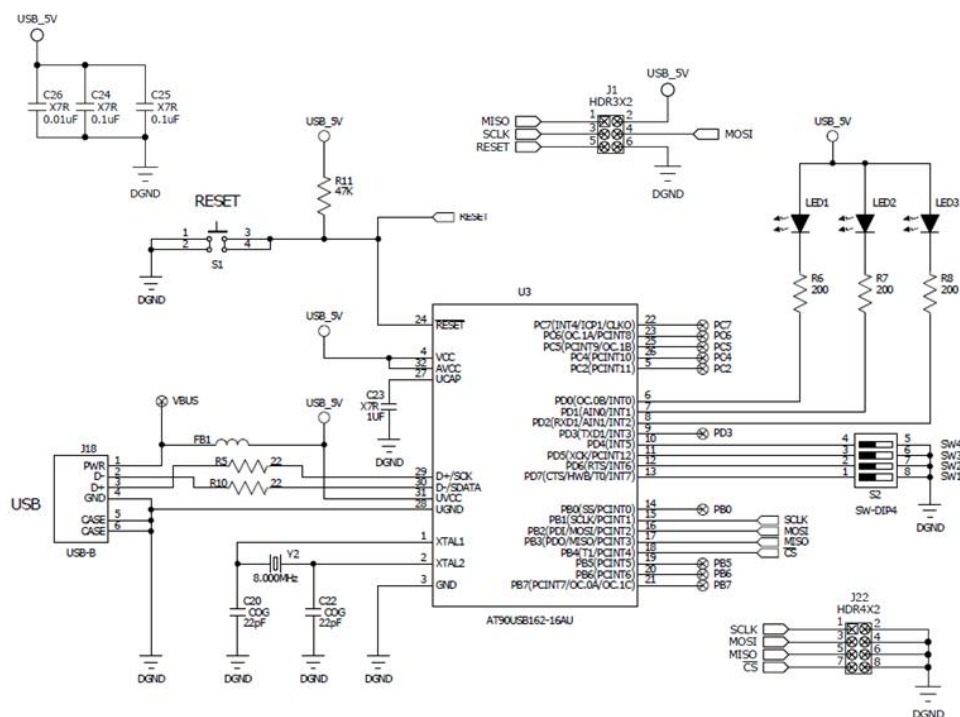


FIGURE 9. MICROCONTROLLER WITH USB INTERFACE

## Note on Power Supply Sequencing

There are two galvanically isolated sections to the board. The ADC portion is powered by a laboratory supply. The microcontroller section is powered by the USB connection.

Proper voltages from an external supply must be provided to the DVDD (3.3V to 5V), AVDD (5V) and the AGND banana plug connectors for the ADC portion of the board to function. LEDs, as shown in Figure 3, will be illuminated by DVDD and AVDD when they are powered. Note that these supplies, AVDD and DVDD, can be applied and removed in any sequence without regard to each other or with regard to whether the USB interface is connected and powered or not. The USB interface can also be disconnected and reconnected without consequence with regard to whether the power supply to the ADC section of the board is powered or not. In other words, there is no power supply sequencing requirement for any of the supplies to the board, whether it be from the laboratory supply powering the ADC section, or whether it be the microcontroller section powered from the USB connection.

## Software

The evaluation board has GUI software available that runs on the PC. The software is designed to operate under Windows XP or later.

See “Appendix #1 How to Obtain and Install the GUI Software” on page 19 to obtain the internet link to download the GUI software.

Once the PC GUI software is copied onto the PC, click on the setup.exe file and follow the on screen instructions to load the software. Note that the software uses the USB interface to communicate with the evaluation board. The software uses the USB HID driver that is part of the Windows operating system so it is not necessary to load any other drivers for the USB interface.

## Running the GUI

Before starting the GUI software the evaluation board should be connected to the PC by means of a USB cable

With the board connected via USB, run the GUI program by selecting Start -> All Programs -> ISL261XX -> ISL26XX Evaluation Software.

If the software is started before the connection to the board is made, the GUI will indicate that the USB interface is not connected with the message: **USB Status: Not Connected** as shown in Figure 10.

If this occurs, connect the evaluation board to the PC with the USB cable. The USB status should change to **Connected** as shown in Figure 11.

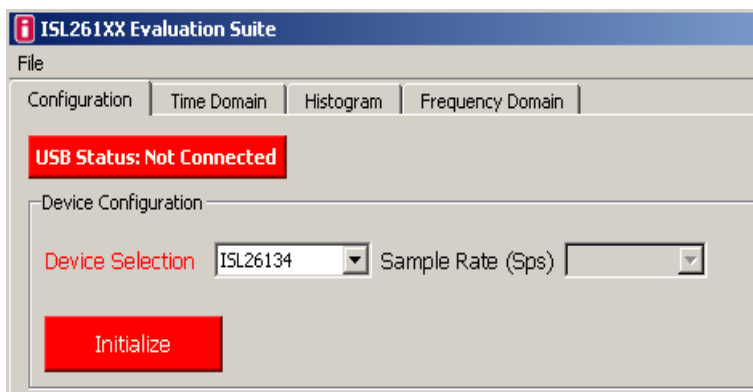


FIGURE 10.

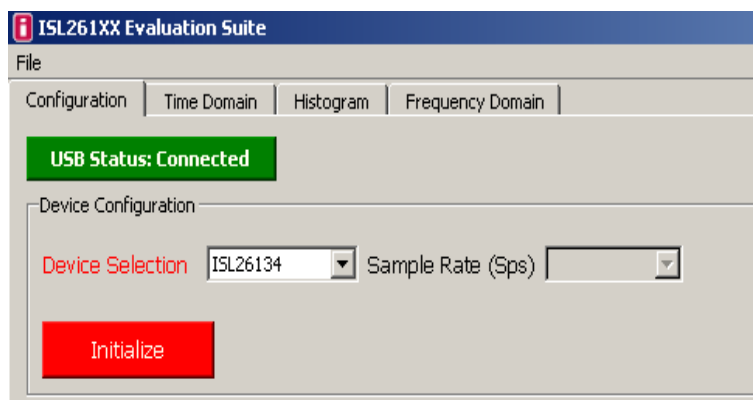


FIGURE 11.



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The screen shows **File**, which is a pull down menu, and four different window tabs, **Configuration**, **Time Domain**, **Histogram**, and **Frequency Domain**. With the screen shown as in Figure 12, the software has the **Configuration** window as the currently active window. The first step of configuration is to select the appropriate part number that represents the evaluation board to be tested using the **Device Selection** window.

Associated with the **Device Selection** window is a pull down menu with various part numbers as shown in Figure 12. The ISL26104 option should be selected and the **Initialize** button clicked to configure the GUI software to operate with this particular evaluation board.

Before the Initialize button is clicked, the ADC section of the board should be powered by the laboratory power supply if the GUI software is to communicate properly with the ISL26104.

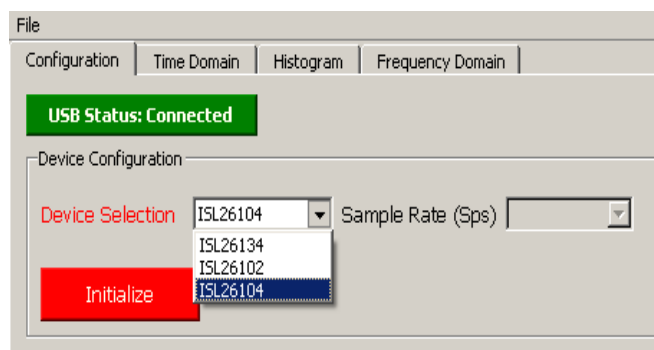


FIGURE 12.

Once the **Initialize** button is clicked with the ISL26104 selection, the screen will change and illustrate a block diagram of the ISL26104 ADC with windows inside the block diagram to select various options, such as the **Input Mux** channel and the **Gain** options available in the ADC as shown in Figure 13.

The ISL26104 device uses on-chip registers as the means for it to be configured. The user of the GUI software can use the **Configuration** window to set up the various options in the ISL26104 device. Some of these options are (1) Input channel (**Input Mux**) selection, (2) **Sample Rate** selection, and (3) **Gain** selection. The ISL26104 allows the user to configure the various settings for the ISL26104 via the **Configuration** window of the GUI as shown in Figure 13. The **Sample Rate** can be set by using the Sample Rate pull down menu as shown in Figure 14. Sample rates from 2.5 to 4000 samples per second can be selected. The **Input Mux** can be changed via a pull down menu as shown in Figure 15. The **Gain** can be changed via a pull down menu as shown in Figure 16. Any time a menu option is changed the **Write Values** button should be clicked. This instructs the GUI software to send a command to the chip to change the appropriate on-chip register. Note that multiple items (Sample Rate, **Input Mux**, **Gain**, etc.) can be changed and the **Write Values** button need only be clicked once for all the selections to be sent to the evaluation board.

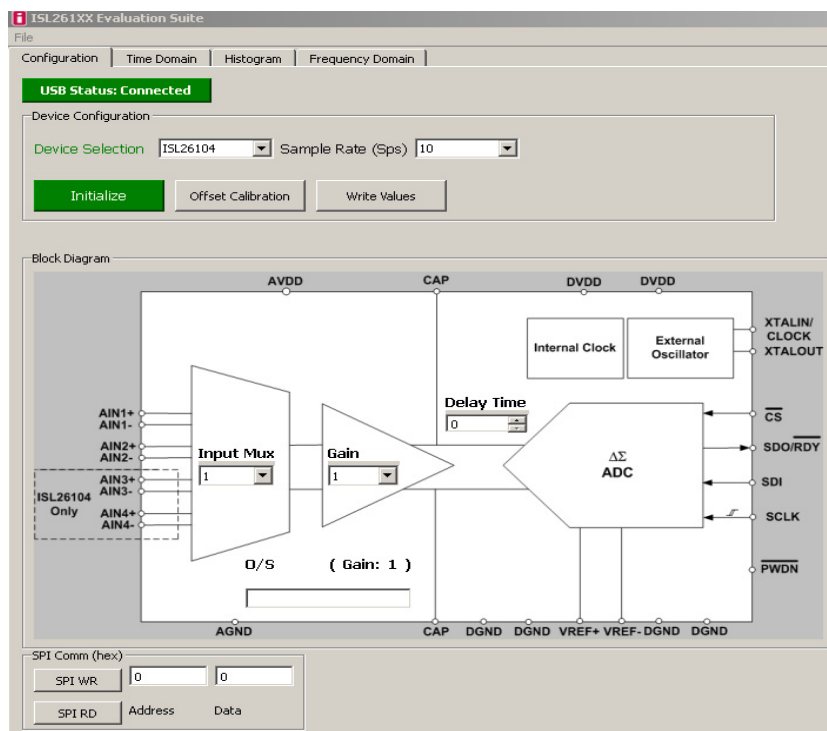


FIGURE 13.

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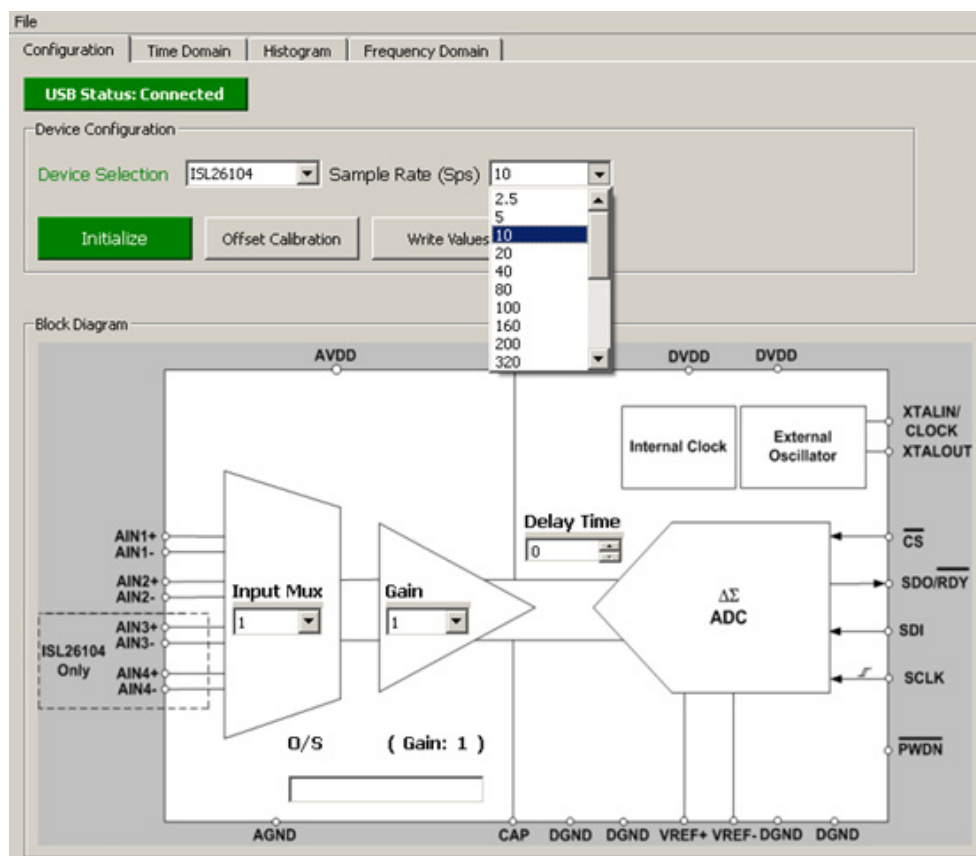


FIGURE 14.

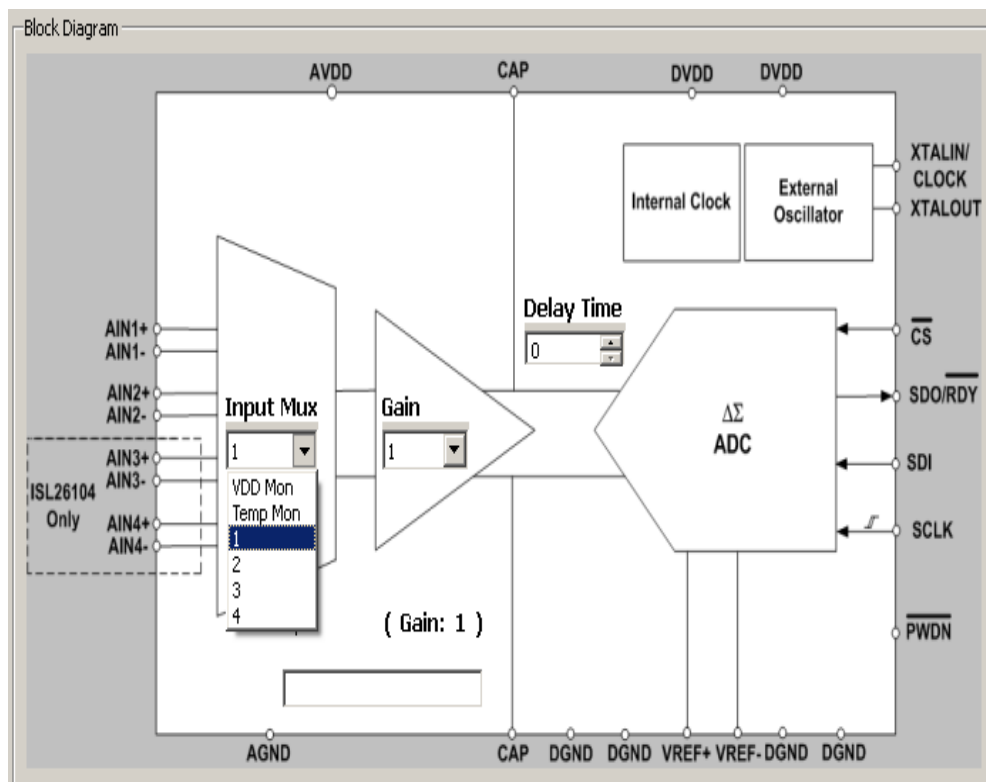


FIGURE 15.

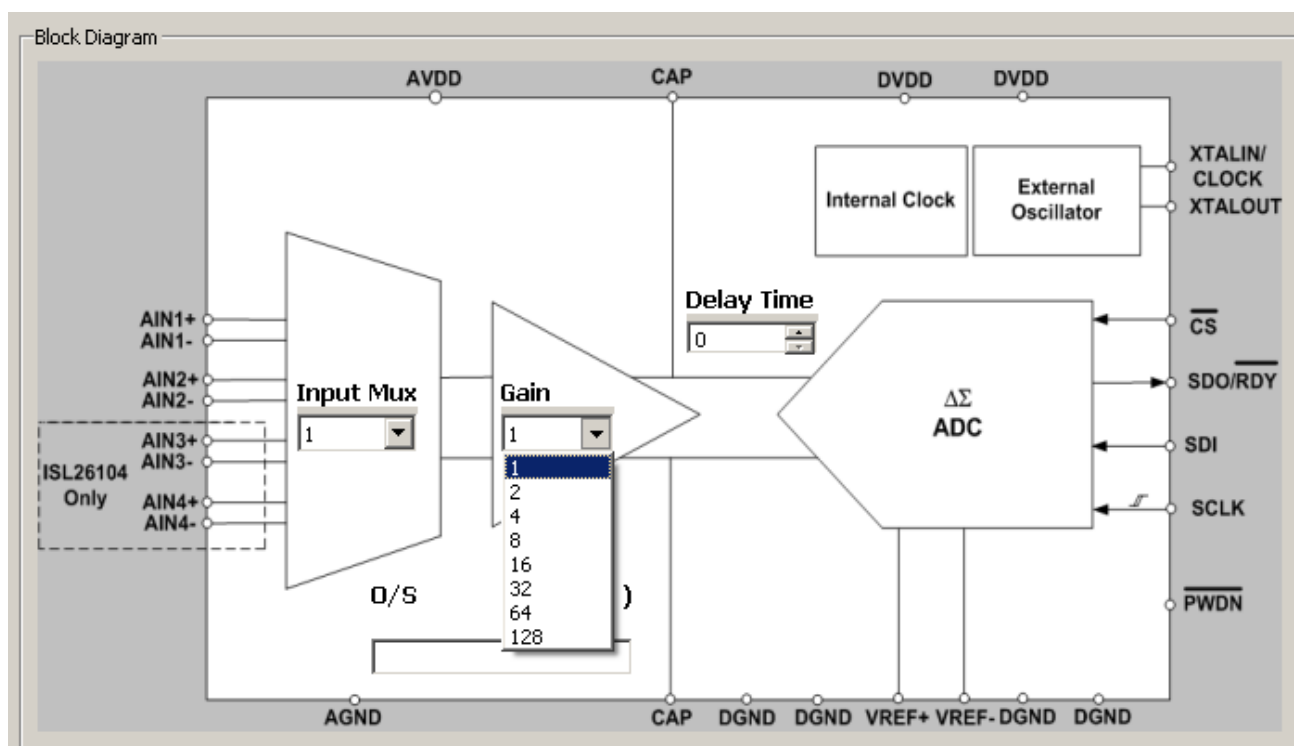


FIGURE 16.

Offset calibration can be performed by clicking the **Offset Calibration** button. This issues a command for the ISL26104 to execute its offset calibration operation. If offset calibration is performed, the value of the on-chip offset registers will be displayed in the **O/S** window in the lower left portion of the block diagram of the chip shown in the **Configuration** window. Note that there are three 8-bit offset registers (high, mid and low) inside the ISL26104 which make up the entire 24-bit offset value. The decimal value of this 24-bit word is what is displayed in the **O/S** window as shown in Figure 17.

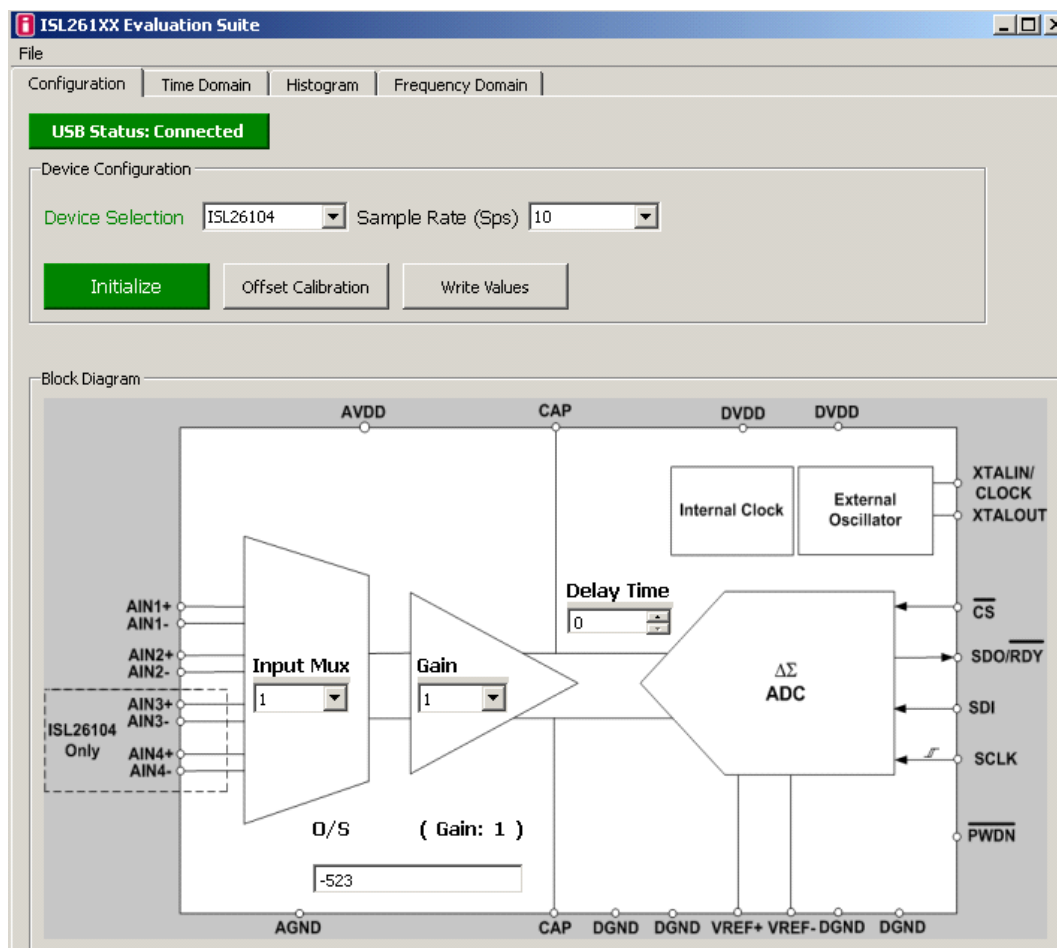


FIGURE 17.

typed as a hex value) into the **Address** window and the click the **SPI RD** button, the value '7' will be returned and displayed in the **Data** window. Hex '7' indicates that the binary value in the register was set to '00000111', gain = 128.

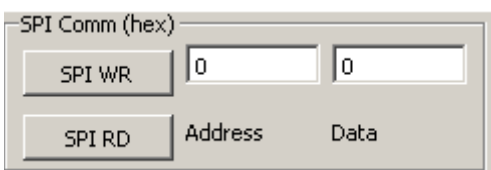


FIGURE 18.

At the bottom of the configuration window, there is an SPI Communications window as depicted in Figure 18.

After writing Hex values into the **Address** text box and into the **Data** text box the user can then click the **SPI WR** button to write an 8-bit value into the on-chip register associated with that address. Or, if the **Data** text window is empty and a Hex value is entered into the Address window, the **SPI RD** button can be clicked. This will cause the 8-bit value of the selected register to be read from the chip and written into the Data text window. For example, if the user selects '128' in the **Gain** pull down menu and then clicks the **Write Values** button, this will set the gain register in the chip for a gain of 128X. One can then use the **SPI Comm** feature to read the register back. Enter 17 [this is the address to read the on-chip gain register] (do not enter the letter h or H as the text window will automatically interpret what is

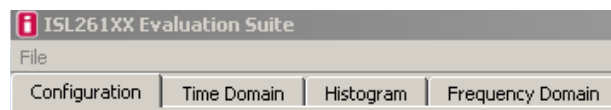


FIGURE 19.

Each of these windows will be discussed in the following sections in detail. All three allow the user to collect and process data from the ADC on the evaluation board.

## Time Domain Window

The **Time Domain** window allows the user to collect samples from the ADC on the evaluation board and display them in the time domain. The number of samples is initially defaulted to 64, but can be set in a pull down window from 1 to 1048576 ( $2^{20}$ ). If a large number of samples is requested on an ADC with a slow

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sample rate, one should be aware of the amount of time required for data collection. When the **Acquire** button is clicked, the samples will be collected and transferred to the PC. The main graphing window can graph up to 256 samples. If more than 256 samples are collected, the time plot of the entire sample set can be displayed by clicking on the **Pop Out** button. Figures 20 and 21 illustrate the capture of 4096 samples. The window in Figure 20 displays only the first 256 samples. Figure 21 illustrates the results when the **Pop Out** button has been selected.

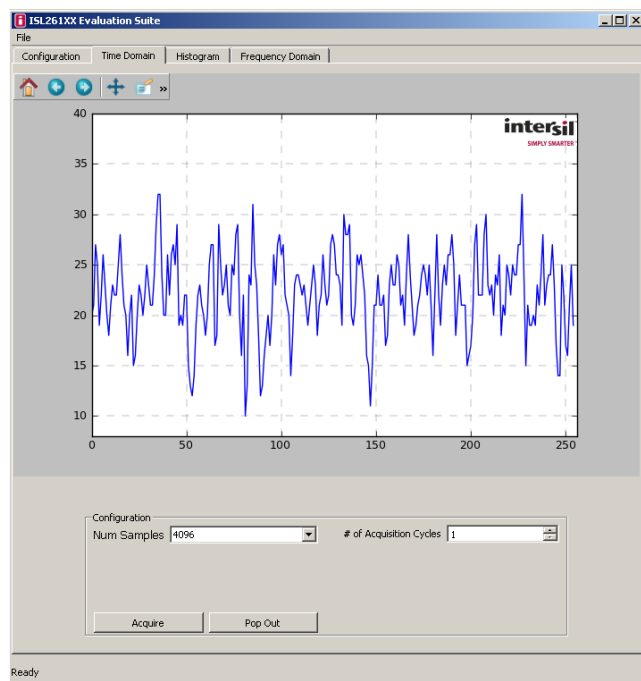


FIGURE 20.

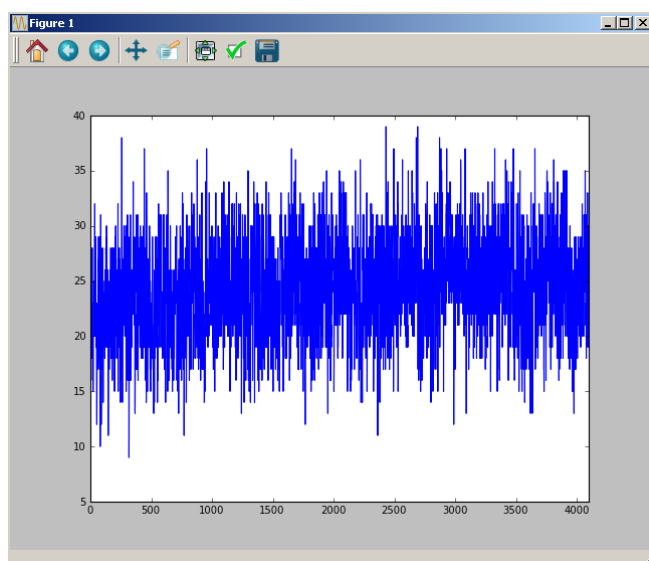


FIGURE 21.

Buttons at the top of the plot provide several user graph tool functions as follows:

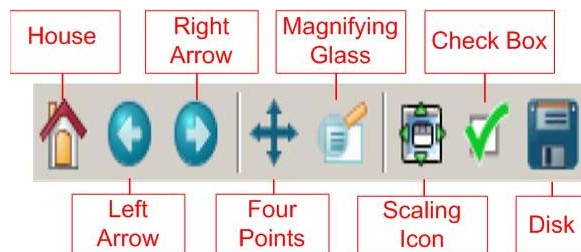


FIGURE 22.

The button options shown in Figure 22 are also available in the **Histogram** and **Frequency Domain** windows.

**House:** Zooms to the original zoom scale factor.

**Left/Right:** Goes back/forward 1 zoom command. So if you zoom in twice and want to go back to the first zoom, you'd click the left arrow.

**Four Points:** Moves the axes around.

**Magnifying Glass:** Zoom box.

**Scaling Icon (Up/down/left/right):** Changes the size of the plot in the window. You can scale the graph as large as the border.

**Check Box (customize):** Allows customization of axis labels/plot title as shown in the Figure 23.

**Disk (Save):** Saves the plot as an image. When selected, a window will open that offers several image format options.

Once the data from the ADC has been captured, it can be saved to a file. The histogram and the spectrum analysis can also be saved. See "Appendix #2 Data File Formats" on page 19 for a discussion of the formats of the saved files. Note that the raw data (conversion words from the ADC) files can also be read back into the GUI once saved. Or data collected from another source can be read into the GUI software for analysis if the proper data format is used. See "Appendix #2 Data File Formats" on page 19 for details.

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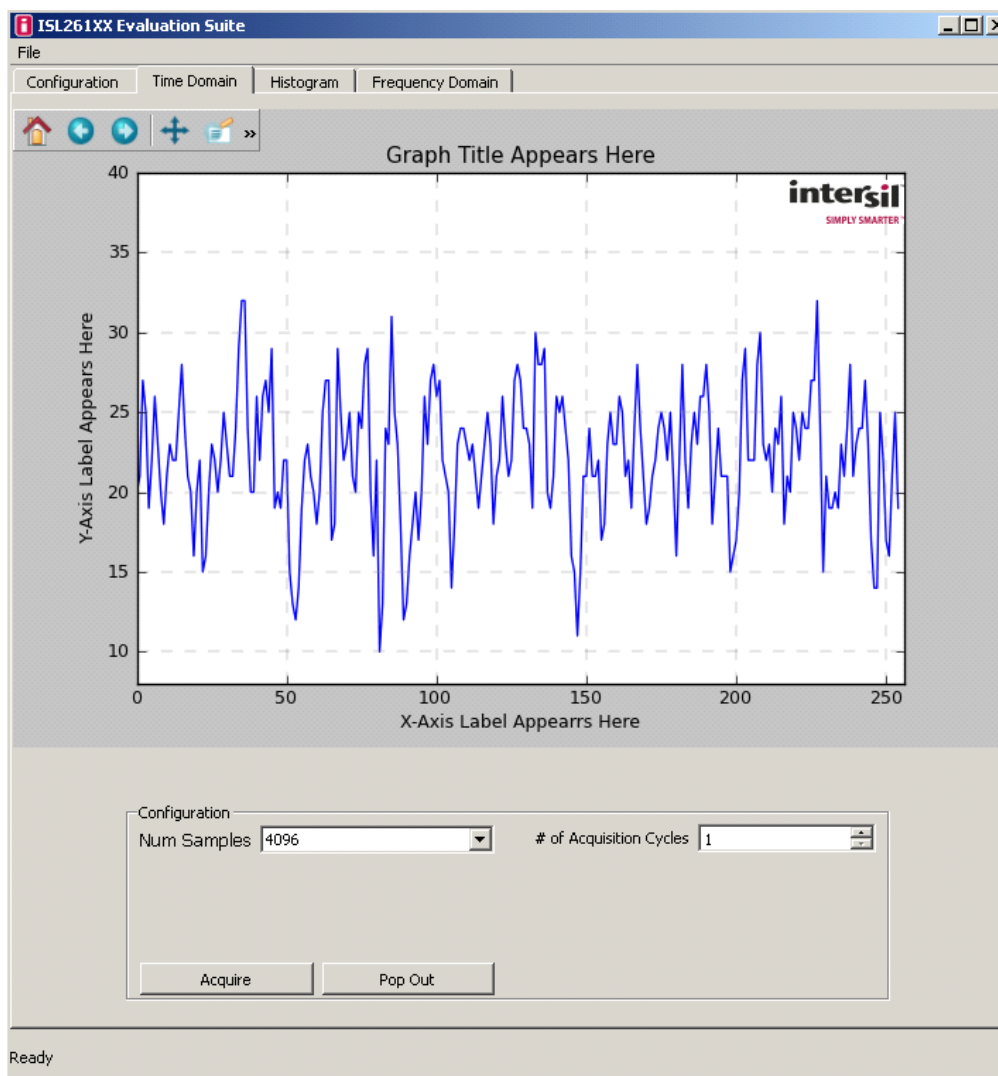


FIGURE 23.

## File Operations

If the **File** label is clicked with the user's mouse, a menu list is shown as in Figure 24.

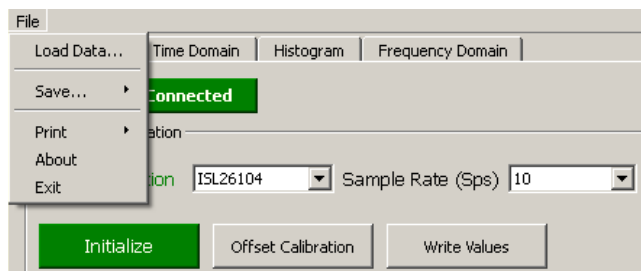


FIGURE 24.



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The **About** selection will be discussed first.

When the GUI is first started it sends a command to the evaluation board and tells the microcontroller to send back the version number of the firmware code that is in the microcontroller. If **File => About** is selected, the GUI will open a window that indicates the version number of the microcontroller firmware, and the GUI software version as shown in Figure 25. Click the **OK** button to close the window.

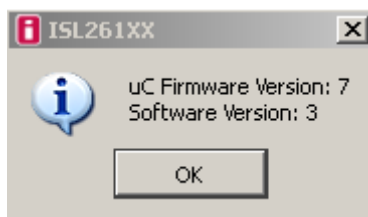


FIGURE 25.

The **File =>Exit** selection is a means to exit and close the GUI program.

The **File =>Save** selection is meaningful only after data has been collected using the functions on the **Time Domain**, **Histogram**, or **Frequency Domain** windows. Figure 26 shows that the options under the **File => Save** selection are **Raw Data (text)**, **Histogram Data (text)**, **Spectrum Data (text)**, **All Data (Excel)**, and **Configuration**. These options allow the user to save data to a file. The file formats for each of the options are discussed in “Appendix #2 Data File Formats” on page 19. Note that the Excel format is for Excel 2003 and supports only 65k cells, which limits the number of samples that can be saved in this format.

The **File =>Load Data** option allows the user to read back into the GUI raw data (conversion words for the ADC) once saved or, data collected from another source can be read into the GUI software for analysis if the proper data format is used. See “Appendix #2 Data File Formats” on page 19 for more information.

The **File =>Configuration** option allows the user to save the register configuration of the ADC that is being used to collect data. See “Appendix #2 Data File Formats” on page 19 for an example configuration file format.

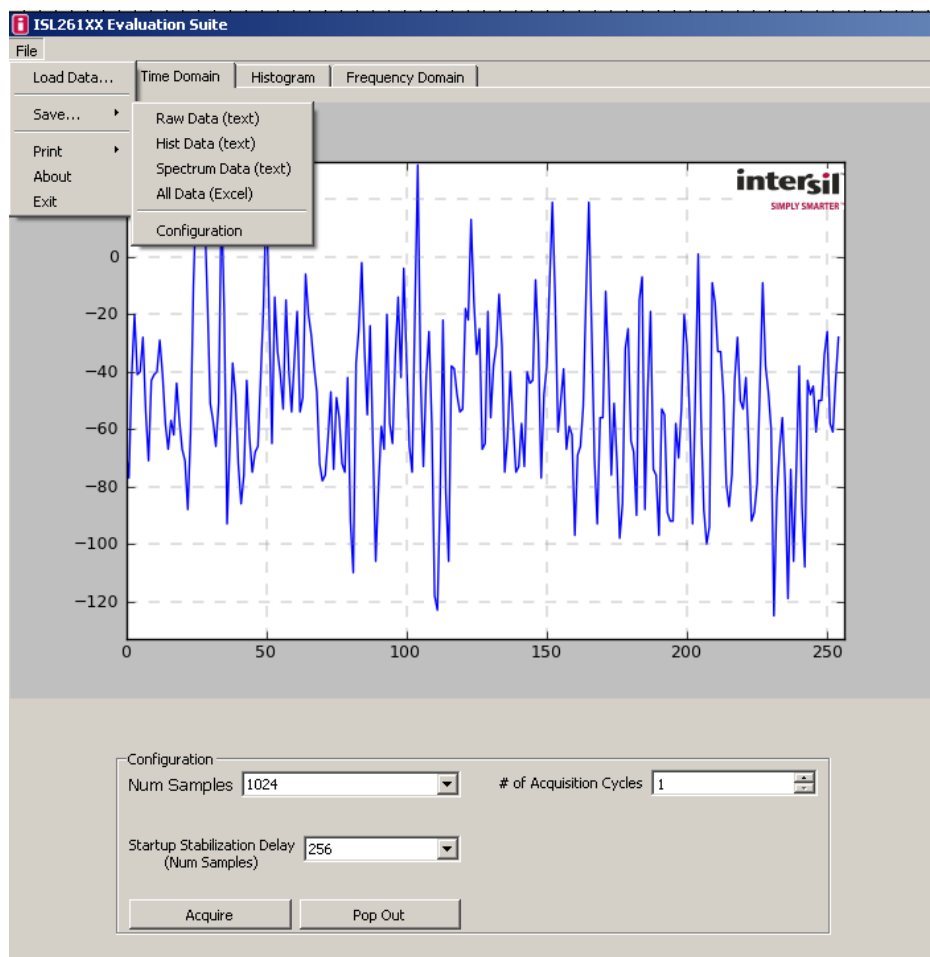


FIGURE 26.

## Histogram Window

If one clicks on the histogram window after collecting data using the **Time Domain** window the histogram of the time domain data will be plotted. Alternatively, the **Histogram** window provides the user options to set the number of samples to be collected and to acquire a new sample set based upon this selection. The **Bin Width** window allows the user to set the number of converter codes that are counted in one bin of the histogram. This number is defaulted to "1".

When the histogram is plotted, the plot includes markers for the mean value (red vertical line) and for one standard deviation from the mean on each side (green dashed lines). Signal statistics are listed in the plot itself and in the text boxes below the graph as shown in Figure 27. The **Pop Out** button shows the graph without the statistics listed.

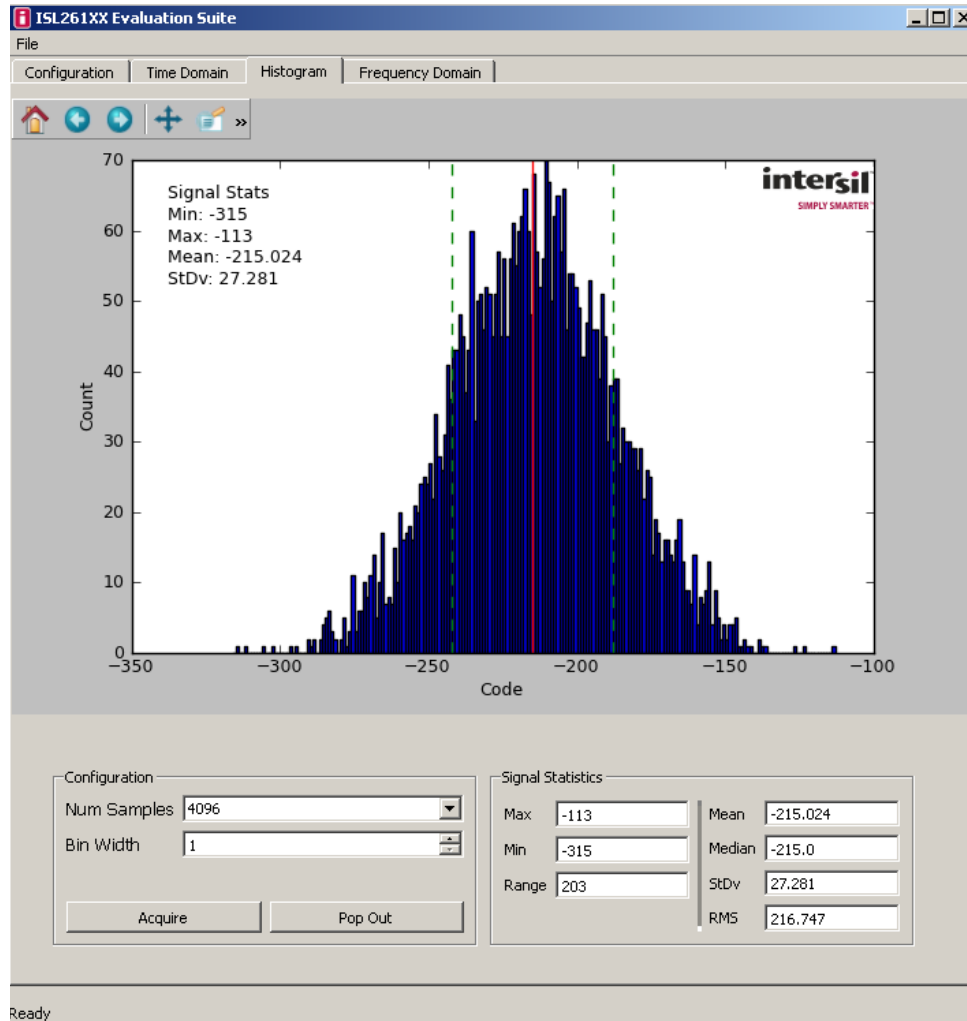


FIGURE 27.

## Frequency Domain Window

If the user has collected data in either the **Time Domain** window or the **Histogram** window, and then clicks on the **Frequency Domain** menu option, the data will be processed with the FFT algorithm and the resulting spectral information will be displayed, as shown in Figure 28. The red lines mark harmonics. If no signal is present, the software assumes the highest point in the spectrum is the fundamental. If the **log(freq)** check box is checked, the spectral plot will be graphed with the frequency axis on a Log scale, as shown in Figure 29. If the **Grounded Input Test** check box is checked, and data is collected with the input of the converter shorted, the GUI software will calculate the various parameters such as SNR (signal to noise ratio) by computing the ratio of an artificial full scale sine wave to the total noise in the bandwidth. The **Grounded Input Test** check box should only be checked if there is no actual signal input into the converter (The board provides a means to short both differential inputs to an ADC channel to a common mode voltage for this test). Note that if the **Grounded Input Test** check box is not checked, the software will compute parameters such as SNR, by calculating the ratio of the largest magnitude component in the spectrum (other than the DC offset) to the noise.

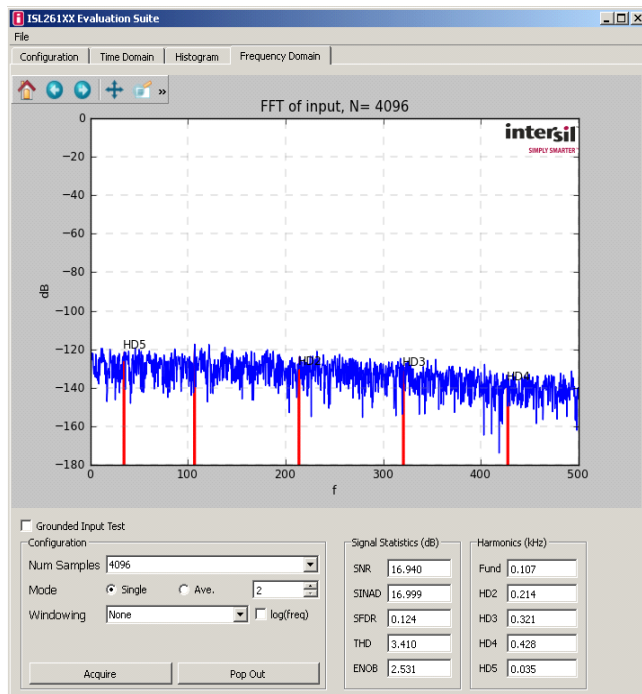


FIGURE 28.

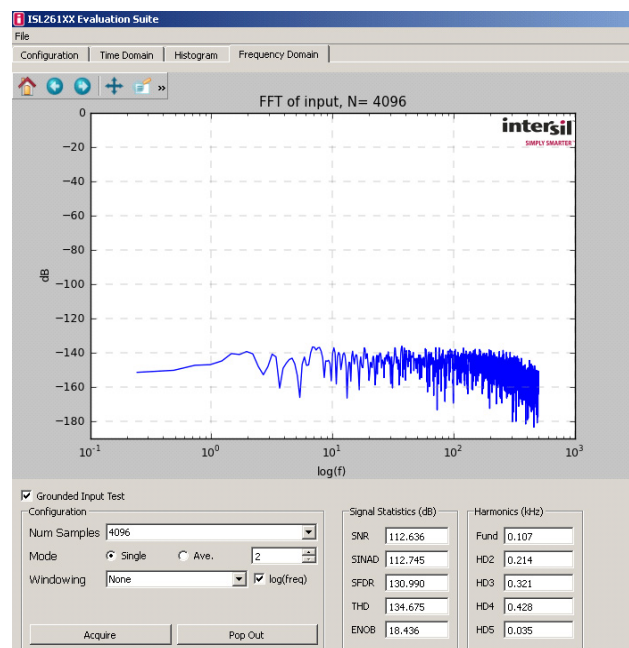


FIGURE 29.

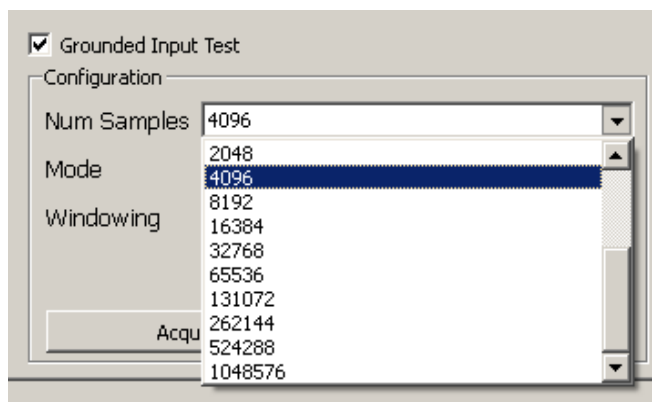


FIGURE 30.

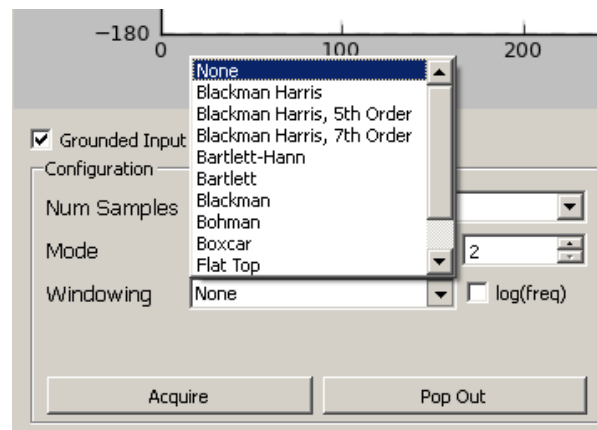


FIGURE 31.

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There are several different selectable options in the **Frequency Domain** window. The number of samples can be set up to 1048576 ( $2^{20}$ ) using a pull down menu as shown in Figure 30. Note that the frequency domain software (FFT computation) must have at least 1024 samples to compute a proper spectral plot. The software allows a number of different window functions to be used. The different windowing options can be selected in the **Windowing** menu as shown in Figure 31. These are normally used when testing is performed with a sine wave as the input signal. This same software GUI supports other ADC platforms (higher speed SAR ADCs) where these windowing options are more commonly used.

Figure 32 illustrates the spectral plot of one data set of 4096 samples. For this data collection, the ADC had its gain set to 1X and its sample rate set to 1000Sps.

The results of the FFT can be averaged by setting the **Mode** radio button to **Ave.** and then using the window next to the **Ave.** button to set the number of data sets to be averaged. When averaging is performed, the output results of many FFTs are averaged and are used to produce a spectral plot with a smoothed (averaged) spectrum as shown in Figure 33.

Recall that the spectrum plot data can be saved by clicking on the **File=>Save=>Spectrum Data** option at the top of the window.

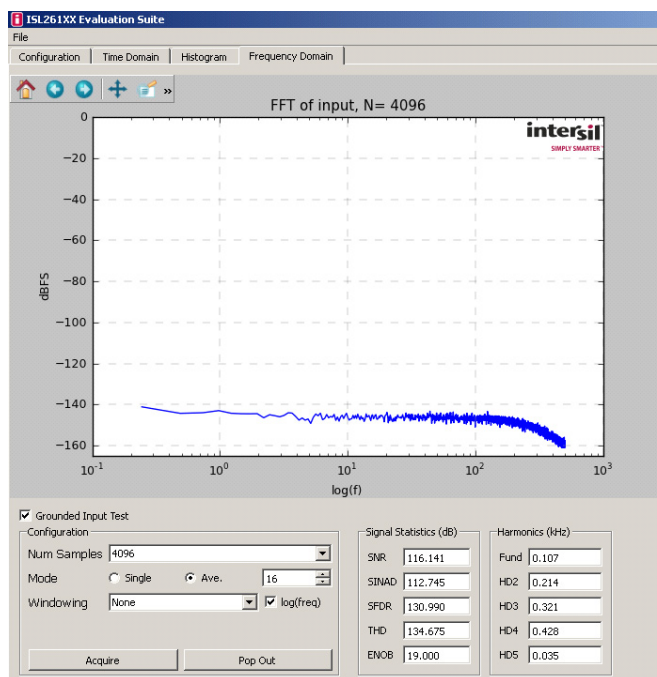


FIGURE 33.

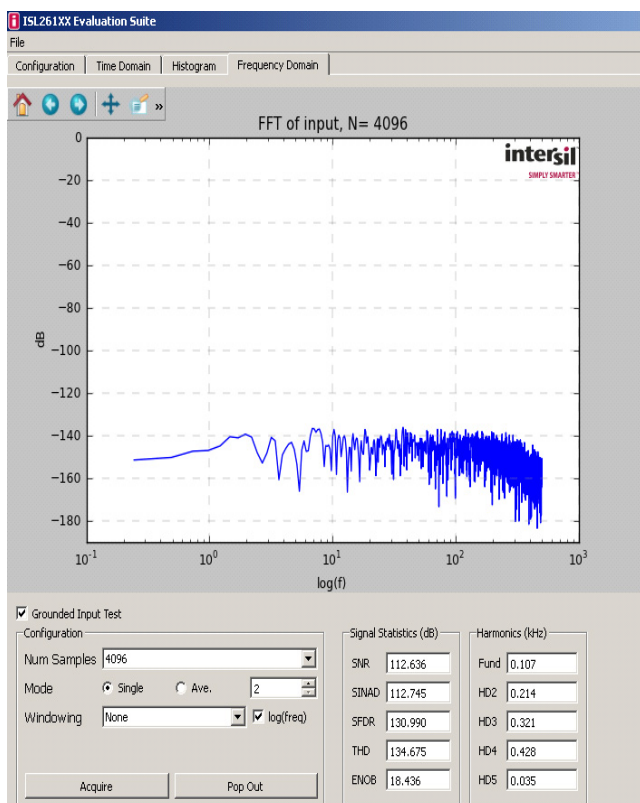


FIGURE 32.

## Appendix #1 How to Obtain and Install the GUI Software

The following is the address for the ISL26104 product page on the Intersil web site.

<http://www.intersil.com/products/ISL26104>

Go to this link and find the “Documents” tab. The PC GUI software installer can be downloaded from this location. Note that the software installer does have a license agreement that will be presented when the software is loaded onto your PC.

## Appendix #2 Data File Formats

The GUI software allows the user to save data from the time domain (raw data), data from the histogram processing, and data from the spectrum processing segments of the software. It also allows raw data (time domain data) files to be read back into the GUI if they have the proper header and format.

### Raw Data

As an example, a time domain collection of only 8 samples has been collected and saved to a file. The content of the file that is saved has the following format:

```
ISL26104
10.0
24
8
-214
-226
-241
-234
-219
-213
-224
-224
```

The file has a header that consists of the part number (ISL26104), the sample rate (10), the number of bits in the conversion word (24), and the number of samples in the file (8). The header is followed by the 8 conversions words in signed decimal format.

### Histogram Data

A data collection of 1024 data words was collected and the histogram performed. The histogram data was then saved into a file. The content of the file has the following format. The histogram statistics are listed first, followed by the converter codes and their respective histogram counts.

```
Signal Statistics
Min: 23
Max: 35
Range: 13
Mean: 29.356
StDv: 1.976
```

Code	Hits
21	0
22	0
23	1
24	2
25	8
26	58
27	103
28	179
29	229
30	164
31	129
32	89
33	34
34	21
35	7
36	0

### Spectrum Data

A data set of 1024 points was collected at a sample rate of 100Sps. The FFT output will produce a spectrum plot with 512 Bins of magnitude data. Only the beginning and ending portion of the data file has been reproduced here to save space. Note that the Bins start at 0 frequency and increase to one half the sample rate (50Hz). Note that the magnitude in dB is the magnitude of the noise in dB below full scale rms but it is scaled based upon magnitude/ $\sqrt{\text{BIN}}$ , not magnitude/ $\sqrt{\text{Hz}}$ .

Freq	Magnitude(dB)
0.0	-127.490860112
0.09765625	-130.138393031
0.1953125	-139.550586747
0.29296875	-132.866111959
0.390625	-127.884217984
0.48828125	-126.538951953
0.5859375	-126.769048076
0.68359375	-131.31820625
0.78125	-149.352655015
0.87890625	-134.478247602
0.9765625	-139.032099632
1.07421875	-133.269604586
XX	
48.92578125	-144.77615475
49.0234375	-154.371891495
49.12109375	-142.708481612
49.21875	-138.531922503
49.31640625	-138.378824752
49.4140625	-142.563086329
49.51171875	-158.690364592
49.609375	-144.250894284
49.70703125	-142.996812327
49.8046875	-144.030316874
49.8046875	-144.707081022



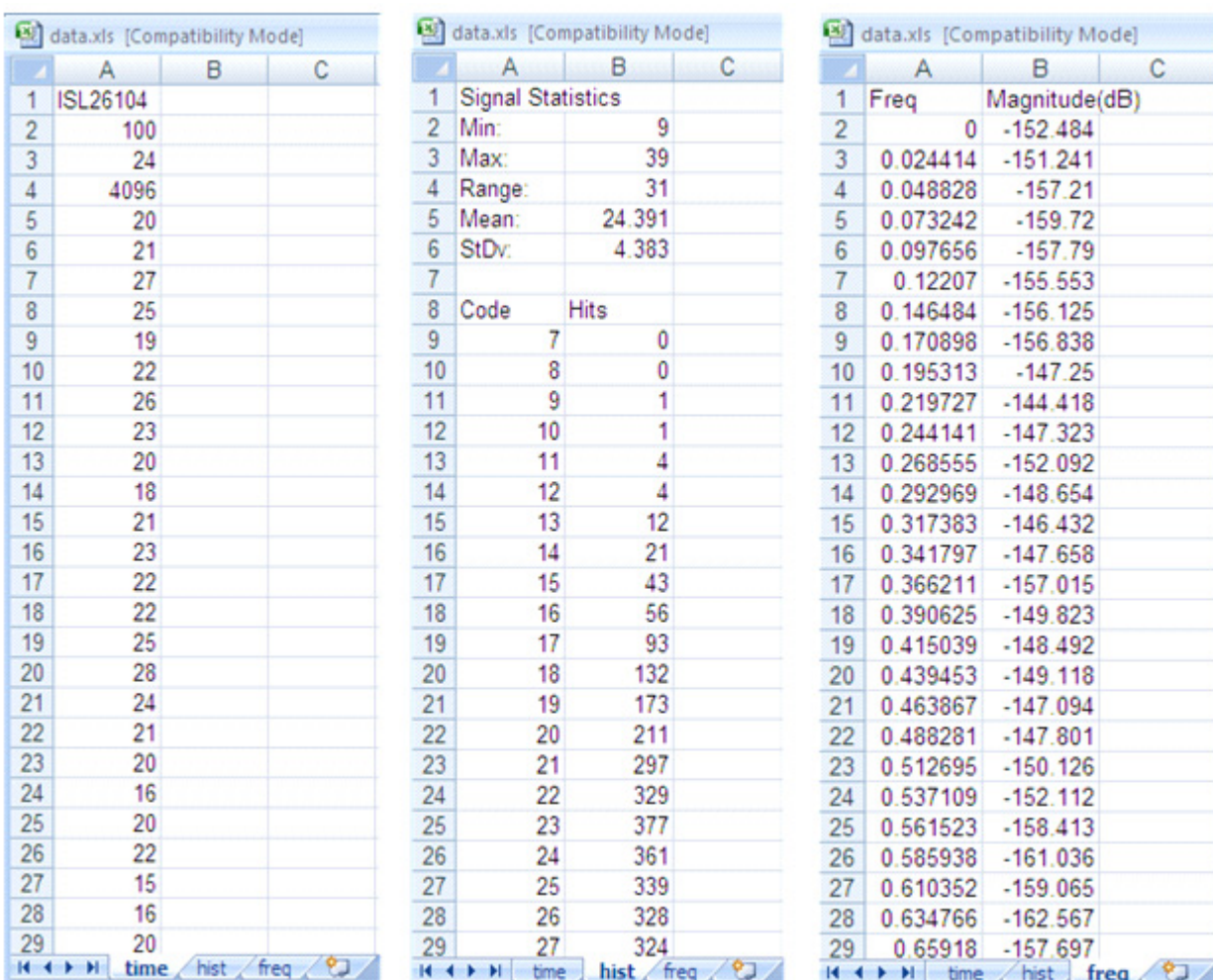


FIGURE 38.

## Excel Data Format

If the **File=>Save=>Excel** option is used, the **Time Domain**, **Histogram** and **Frequency Domain** data will be saved into an Excel file with each of the three data sets on a different sheets as shown in Figure 34.

Note that the Excel format is for Excel 2003 and supports only 65k cells which limits the number of samples that can be saved in this format.

## Configuration Data

TABLE 1.

ISL26104 REG. NAME	REG. ADDR	REG VALUE (HEX)
Word Rate	0x85	0xb
Input Mux	0x87	0x0
Channel Ptr	0x88	0x0
PGA Gain	0x97	0x0
Delay Timer	0xc2	0x0

## Load Data Function

The GUI allows raw (time domain) data to be loaded back into the GUI. Alternately, the user might collect data in another system and import the conversion word data into the GUI to perform analysis. To be able to read the data the file must have the proper header (as discussed previously in the "Raw Data" on page 19 of this appendix).

The header must have a header with a part number (this can be something other than a chip number), sample rate, number of bits in the converter, and the number of samples, followed by the data in decimal format. The largest value of any reading cannot exceed one half  $2^{(number\ of\ bits\ in\ the\ converter)}$ . For example, if the number of bits in the converter is 12, then the largest reading can be no greater than  $(2^{12})/2$  or 2048.



ISL26104 > part number  
 100.0 > sample rate  
 24 > number of bits in the converter  
 8 > number of data samples in the file  
 -394 > conversion data in signed decimal format  
 -361  
 -405  
 -411  
 -397  
 -416  
 -423  
 -416

## Appendix #3 USB VID and PID

The VID (vendor ID) for Intersil = 09AA and PID (product ID) = 201C for the evaluation board can be found by examining the Windows Systems Information under Components => USB. It will be listed as a HID Compliant device with the VID and PID indicated as follows:

HID-compliant device      HID\VID\_09AA&PID\_201C\6&2ADC8489&0&0000

## Appendix #4 Evaluation Board Factory Jumper Settings

Figure 35 indicates the position of the header shunts when the board is shipped from the factory.

Header J17 is connected with the 2.5V reference selected as the common mode voltage.

Headers J9 and J10 are shorted with shunts to connect the common mode voltage to the AIN1+ and AIN1- signals coming from the terminal block connector. This effectively shorts both inputs to Channel 1 on the ADC to the common mode voltage and enables the ADC to be tested with a shorted input. One or both of these jumpers must be removed if the ADC is to measure a signal on this channel.

Headers J25 and J26: the 2.5V\_VREF option is selected on J25. The AGND option is selected on J26. These enable the 2.5V voltage reference chip to be the voltage reference for the ADC.

DIP switch: Switches S2-1, S2-2, S2-3 and S2-4 must be positioned in the off position. If the switches are positioned with any switch in the closed (ON) position, the microcontroller will be put into a factory test mode, or into a non-functional state. If the microcontroller is in either of these states, it will not communicate properly with the PC software GUI.

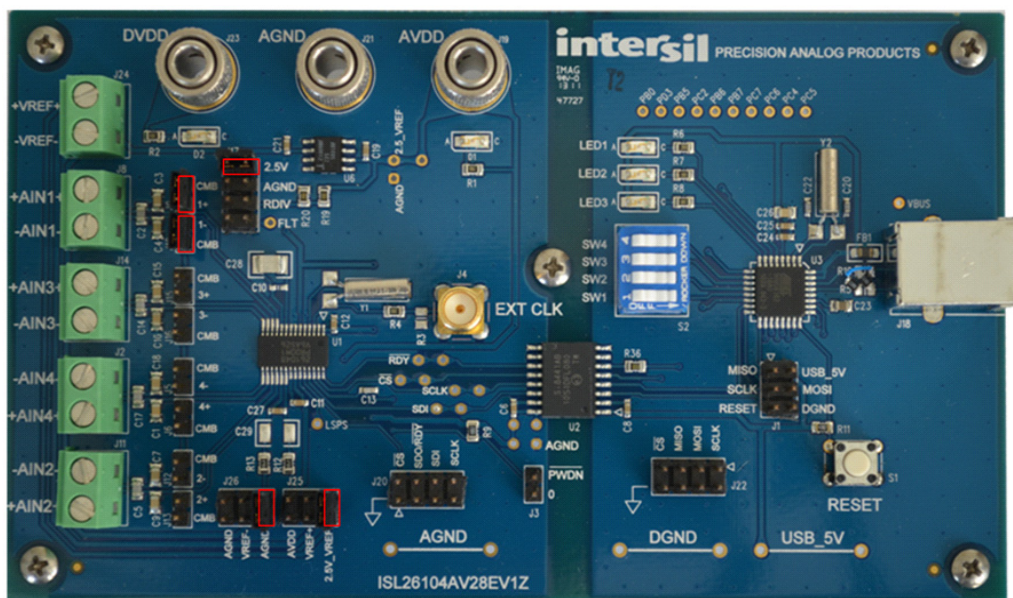


FIGURE 35.

## Appendix #5 Evaluation Board Layout and Component Placement

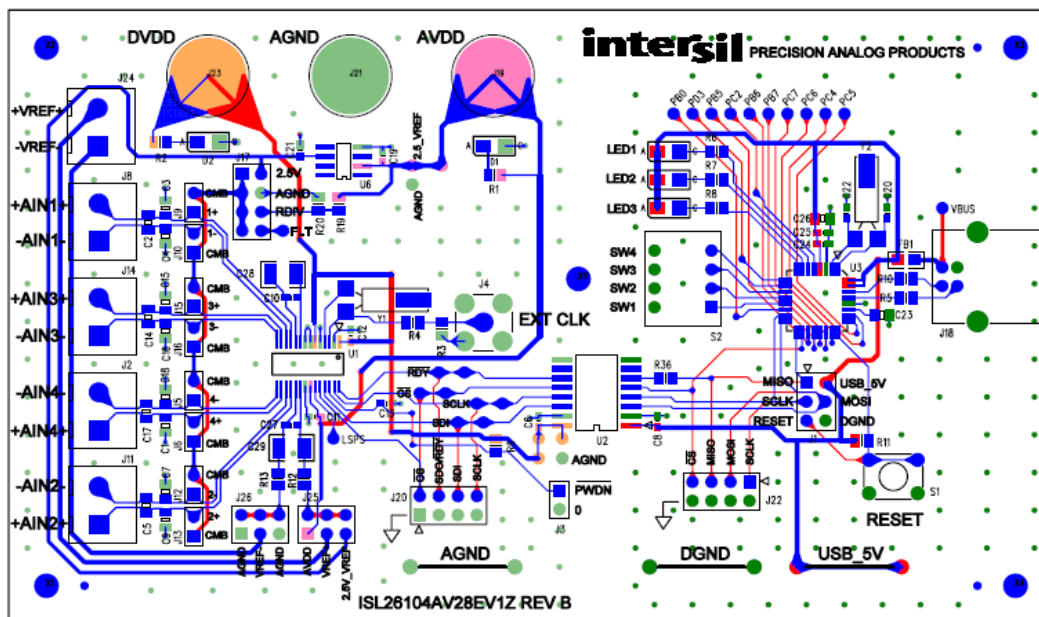


FIGURE 36.

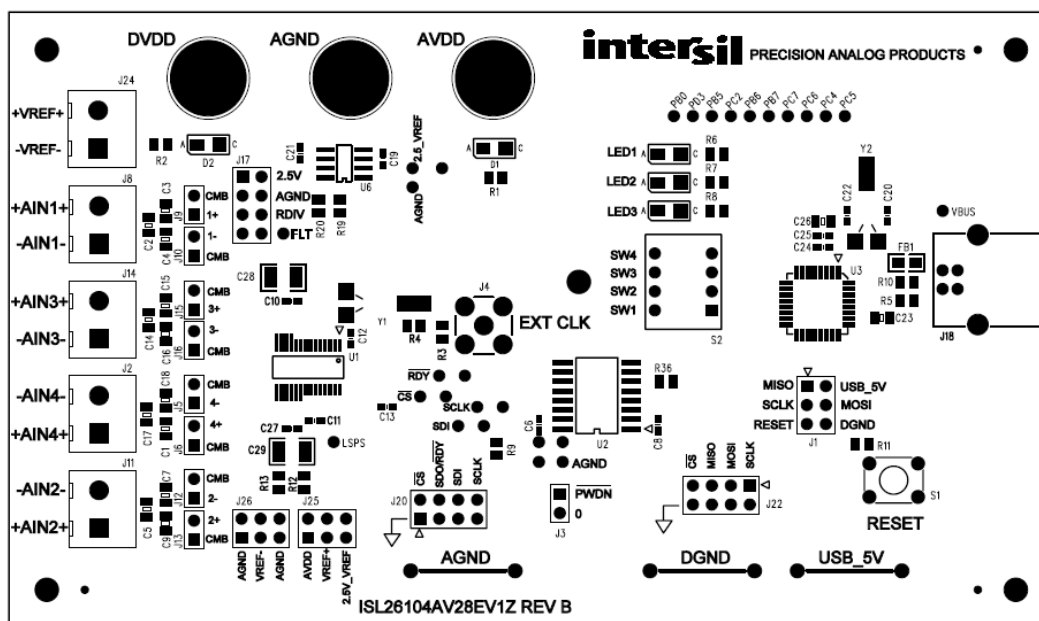


FIGURE 37.

Intersil Corporation reserves the right to make changes in circuit design, software and/or specifications at any time without notice. Accordingly, the reader is cautioned to verify that the Application Note or Technical Brief is current before proceeding.

For information regarding Intersil Corporation and its products, see [www.intersil.com](http://www.intersil.com)

# ISL26104AV28EV1Z Schematics

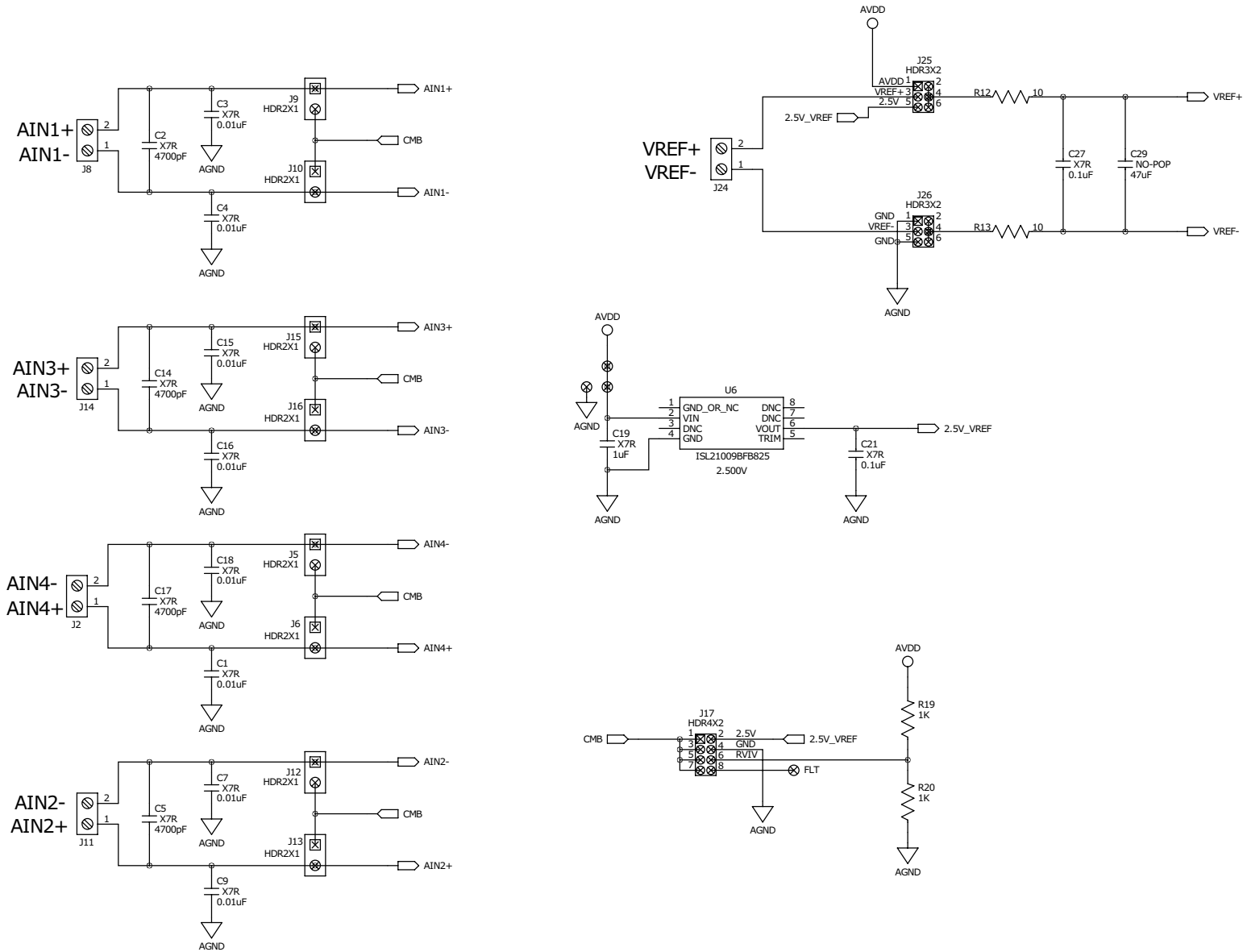


FIGURE 38.

# ISL26104AV28EV1Z Schematics (Continued)

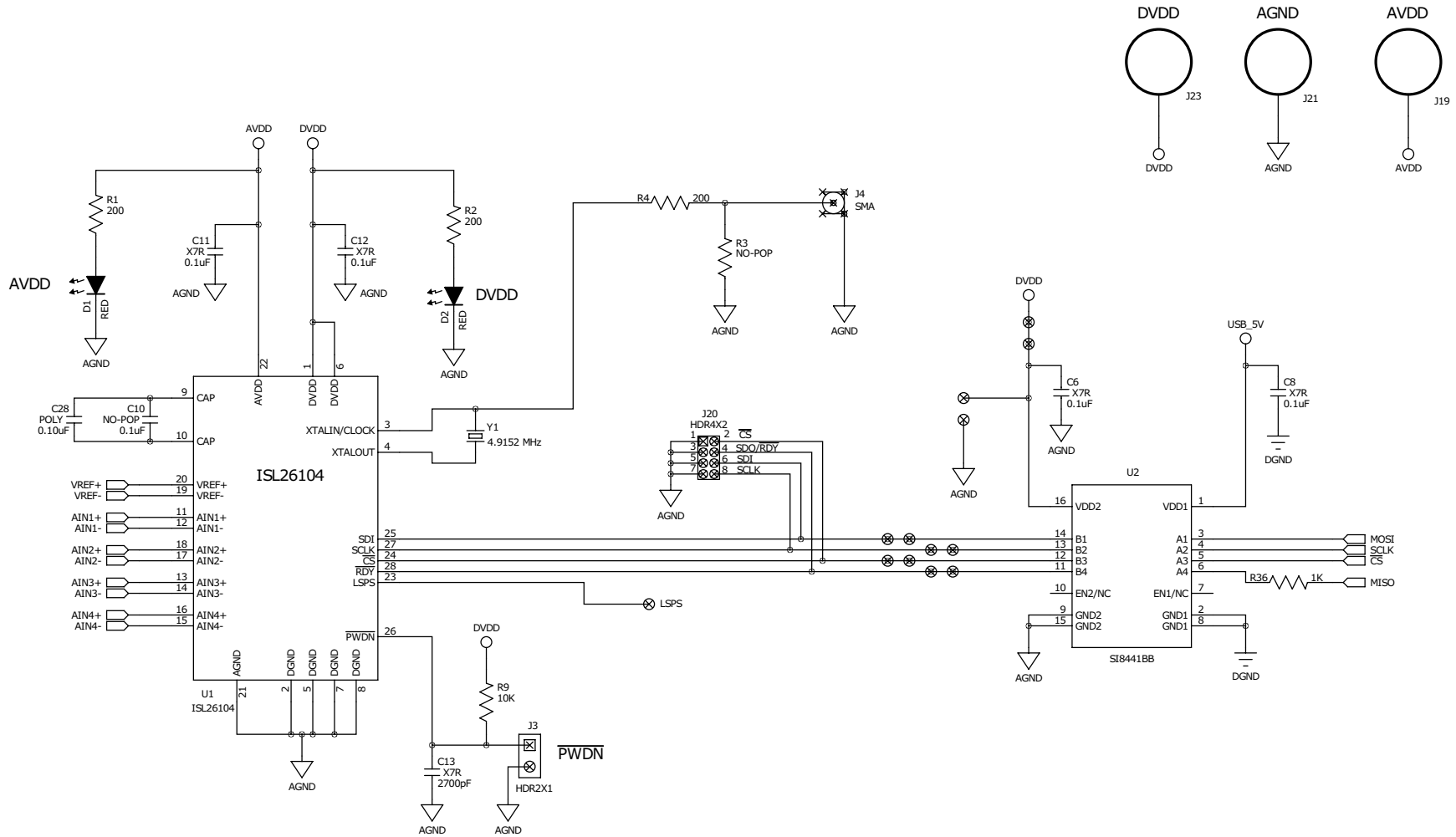


FIGURE 39.

# ISL26104AV28EV1Z Schematics (Continued)

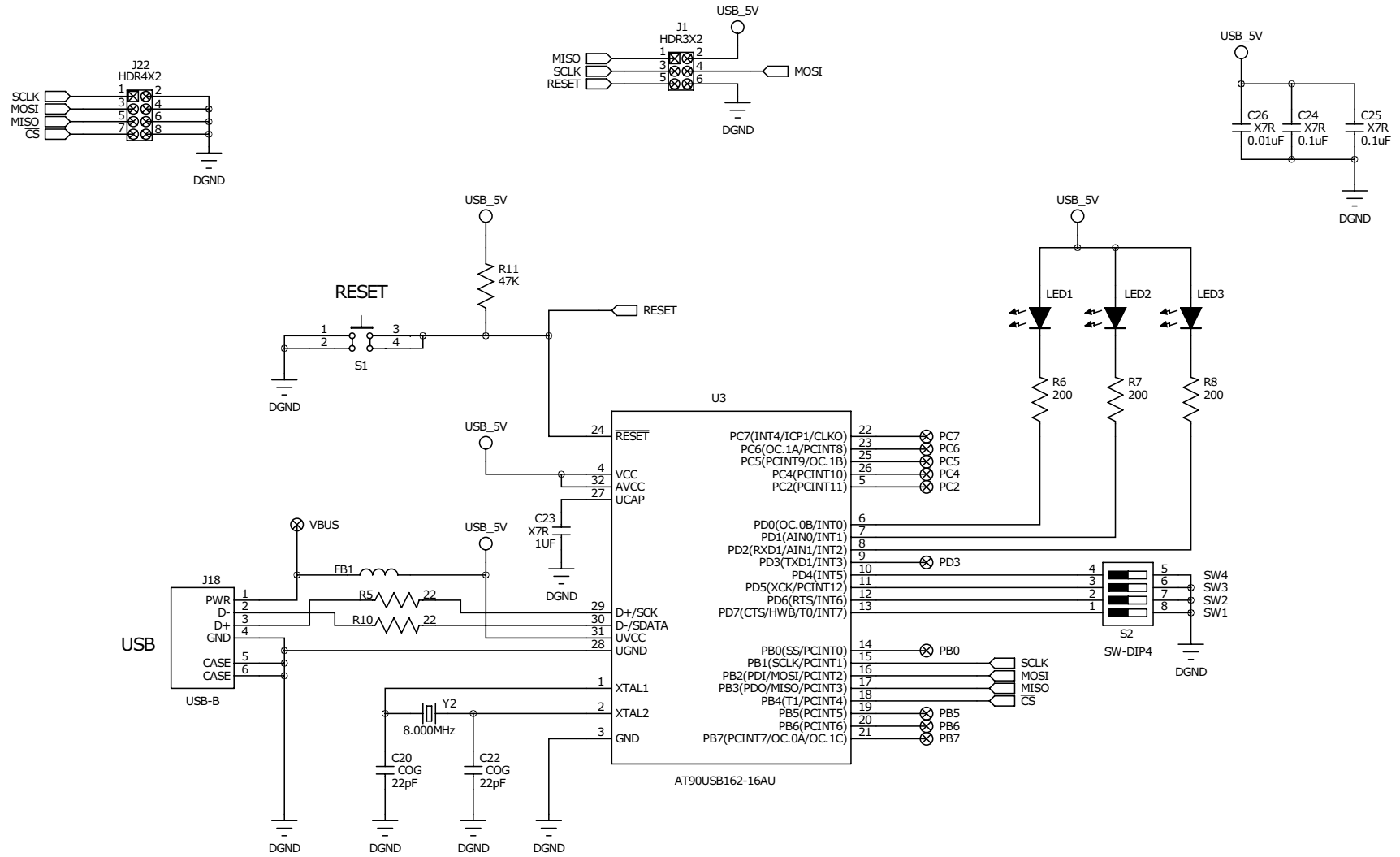


FIGURE 40.