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SX8723/24/25 Evaluation Tools XE8000EV121

User's Guide

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1 Introduction

1.1 Context

The tool context is to enable the user to create an engineering environment that enables him to evaluate the SX8723/24/25 chip performances.

The tool is intended to be the interface between the sensor and the PC in order to ease the handling of the SX8723/24/25.

The tool is made of 2 parts:

- XE8000EV121: Gives access to all pins of the SX8723/24/25 and provides all the hardware interfaces needed to evaluate it.
- “SX87xx Evaluation Tools” Graphical User Interface (GUI): Gives the user a clear view of the registers content and allows the using of all modes and commands described in the SX8723/24/25 datasheet.

1.2 Global function

The SX8723/24/25 evaluation board's main function is to give the user the possibility to develop its application by interfacing his sensor, choosing its power supply, finding the best configuration parameters via the GUI, etc.

2 Installation

2.1 Installing the GUI and required software

Put the SEMTECH CD ROM in your computer and if the installation does not start launch the file “setup.exe” located at your CD ROM root directory.

The Installer will propose you to install the “SX87xx Evaluation Tools” GUI and the software needed to make it work.

2.1.1 .NET Framework 2.0

The GUI needs the .NET Framework 2.0 to work properly. The installer proposes to install it, if the installer is unable to detect it on your system.

2.1.2 FTDI USB drivers

The XE8000EV121 board uses a USB to UART converter from FTDI-Chip thus to the board work properly the USB drivers must be installed.

If the USB drivers are not detected on your PC their installation will be proposed.

2.2 Connecting the board for the first time

Connect the board to your USB port, and then switch on the XE8000EV121 using the “power” switch (top left side of the board).

Note: Ensure that the jumper at the right of the power switch is either connected on 2.5V, 3.3V or 5V_USB.

Note: The first time you connect the kit, the system will install your XE8000EV121 connection as a new Serial COM port device.

For more information on how to determine which Serial COM port has been assigned please refer to §2.3.

Once the board is connected launch the GUI from Windows “Start Menu->Programs->SX87xx->SX87xx” and the GUI main window will open.

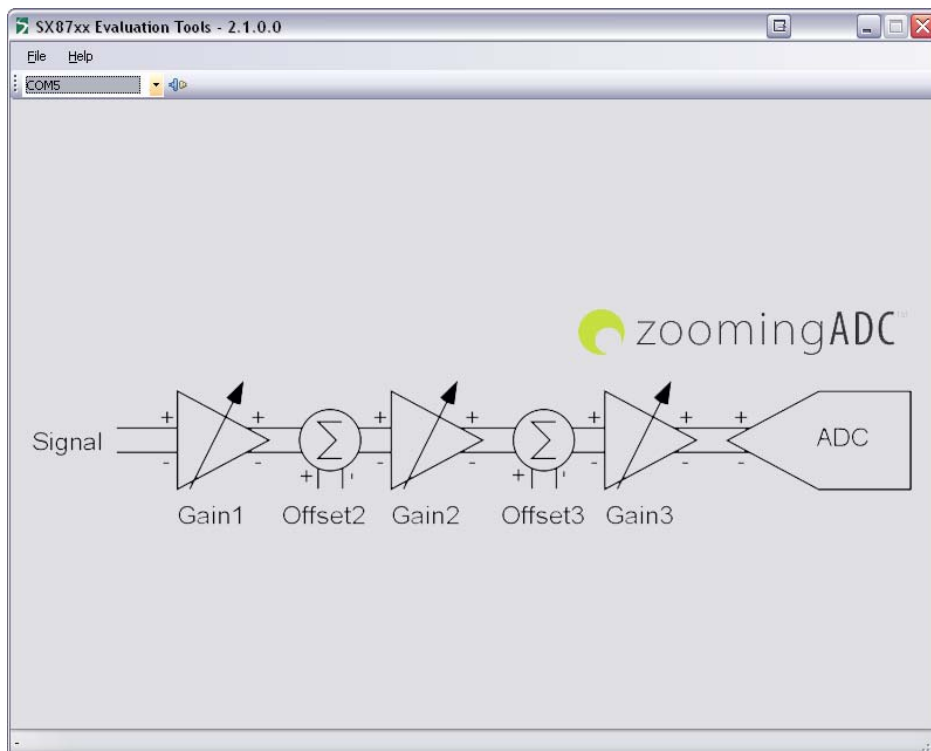


Figure 1 Main GUI window

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Select the Serial COM port corresponding to your XE8000EV121 board on the GUI toolbar.

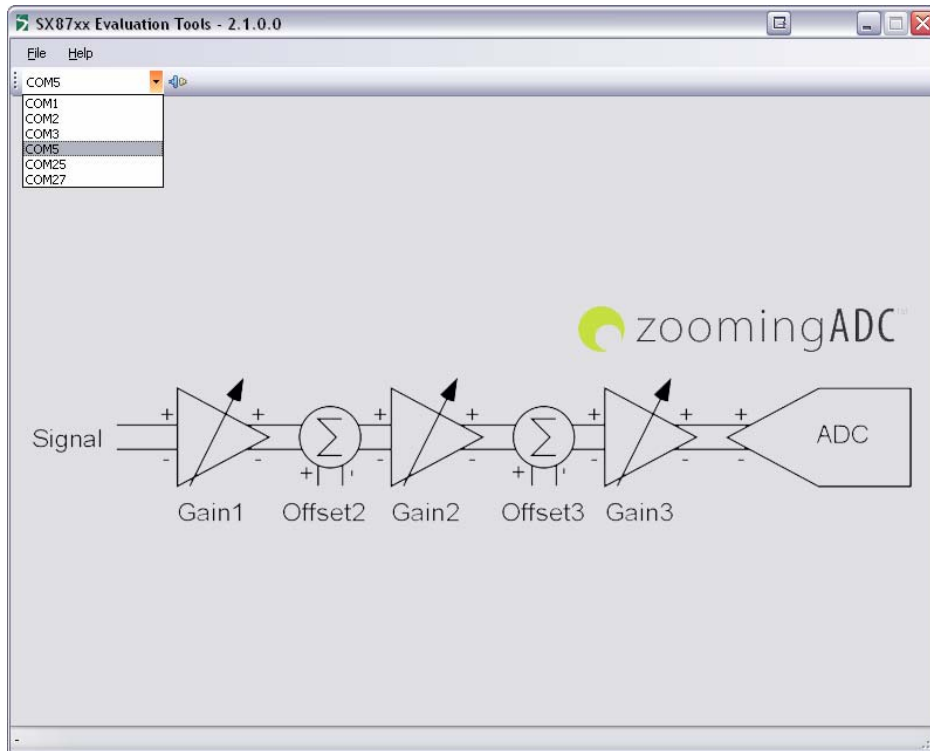


Figure 2 Serial COM port selection

Click on “Open COM” button located on the GUI toolbar.

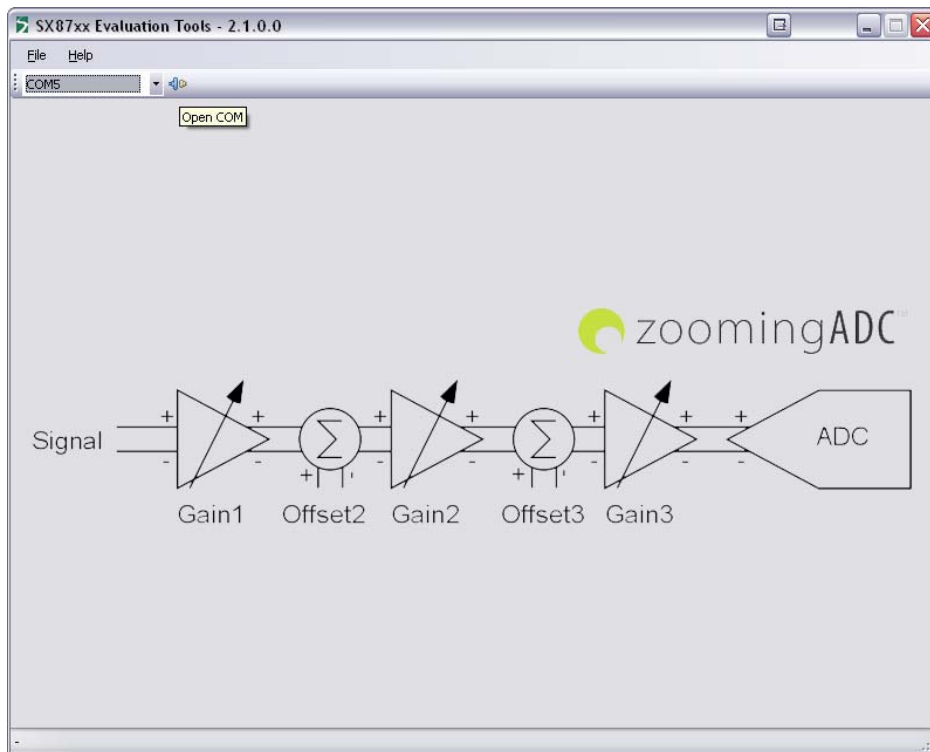


Figure 3 Open Serial COM port

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Once the Serial COM port is open the application will read all the SX8723/24/25 registers in order to update the GUI.

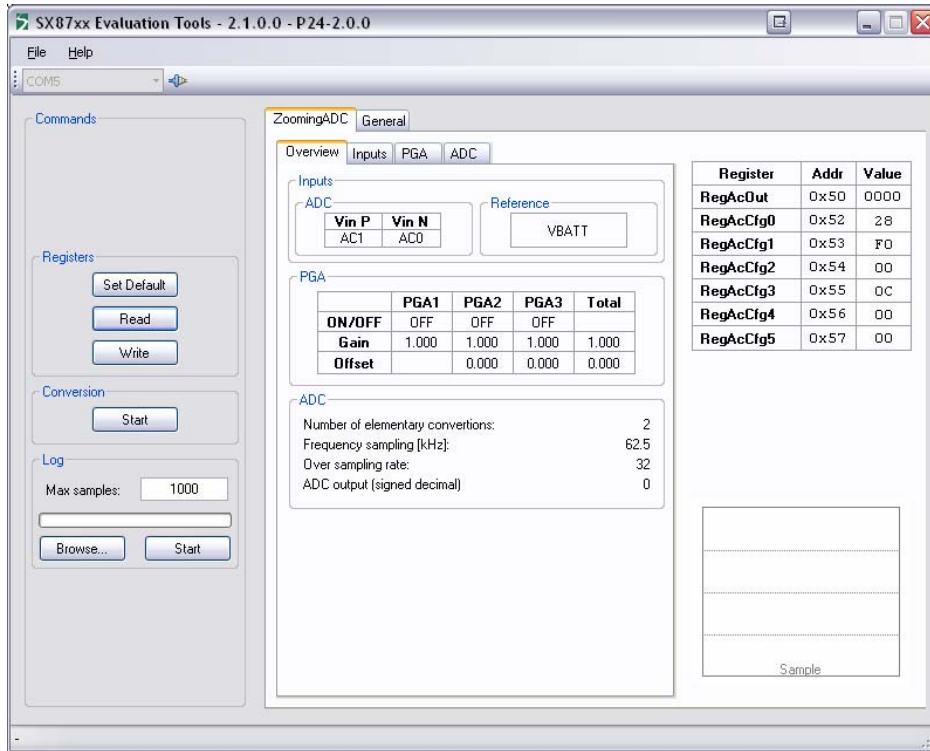


Figure 4 GUI after Serial COM port is opened

2.3 How to determine which com port has been assigned to the XE8000EV121 board

There are two ways to determine which COM port your XE8000EV121 is using:

1. Using the GUI:
 - Click on the Serial COM port dropdown list as shown in Figure 2 and keep in mind the displayed Serial COM ports.
 - Select one of the Serial COM ports.
 - Switch off the XE8000EV121.
 - Click on the Serial COM port dropdown list as shown in Figure 2
 - The Serial COM port that has disappeared from the list the one assigned to your XE8000EV121 board.
2. Using the Windows Device manager
 - Open the Windows Device Manager by clicking on Windows “Start Menu->Settings->Control Panel->System->Hardware” and then click on “Device Manager” button.
 - Develop the “Ports (COM&LPT)” section
 - Switch ON and OFF the XE8000EV121 board
 - The Serial COM port assigned to the XE8000EV121 is the one that disappears and reappears each time.

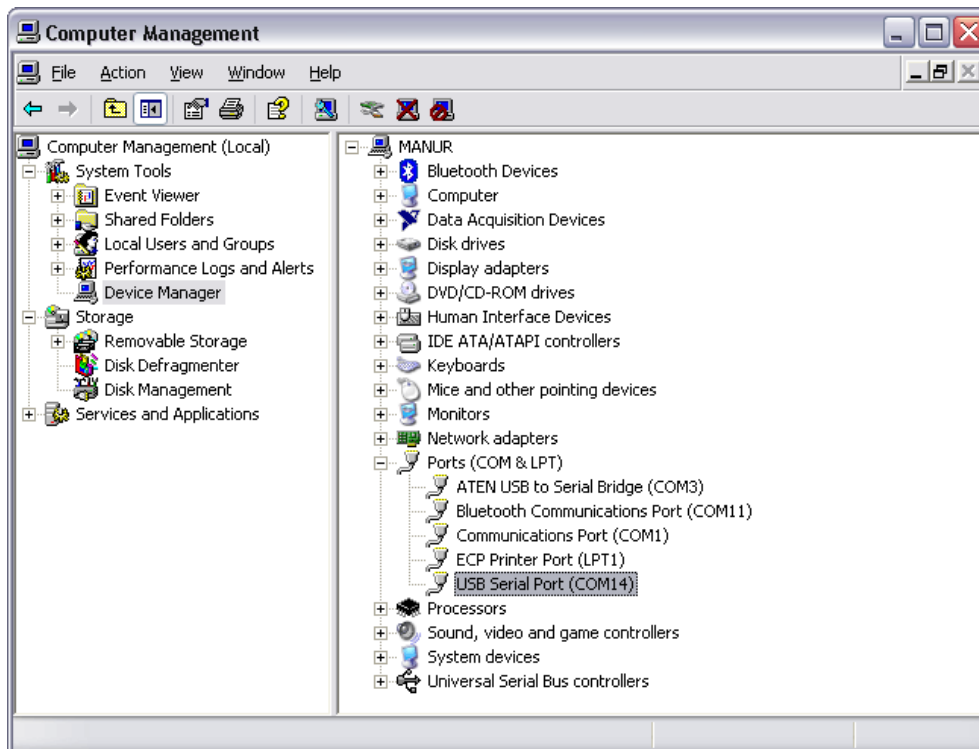


Figure 5 Windows Device manager

3 Hardware description

3.1 XE8000EV121 Board features

- Ease the access to every SX8723/24/25 pin.
- Dedicated interfaces for connection to the external world.
- USB interface for communication between the GUI and the chip.
- Power supply flexibility (USB, battery, DC connector...).
- User interface (LEDS, buttons...).

3.2 Communication between PC, Gateway and SX8723/24/25

The communication protocol between the PC and the gateway is made of frame exchanges. A frame is composed of a type, a size and a customized data buffer. There are 3 different types of frame: command request frame, command response frame and data frame.

The command request frame is sent by the PC to the gateway. The command response frame is sent by the gateway to the PC as a response to a command request. There is a command response sent for every command request received.

The command request frame and command response frame are implied in the following procedure:

- 1- PC sends a command request to the gateway via the UART.
- 2- The gateway will execute the command (using I2C connection with SX87xx).
- 3- The gateway will send a command response frame with the command result to the PC via the UART.

The data frame is used to send the measured value from the SX87xx ADC to the PC.

The data frame is implied in the following procedure:

- 1- SX87xx validate its READY output.
- 2- The gateway fetches the ADC measured value (using I2C connection with SX87xx).
- 3- The gateway will send a data frame with the measured value to the PC via the UART.

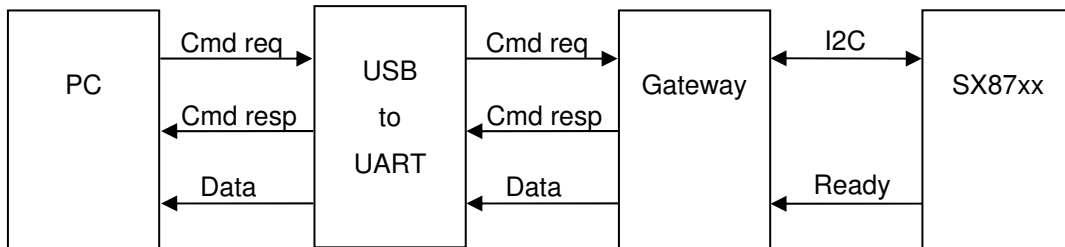


Figure 6 Hardware block diagram

3.3 Power sources specification

Voltage range	Min	Typ	Max	Unit	Comments
1.3mm DC Plug	6	8	15	V	Regulated ¹
USB 5V	4.5	5	5.5	V	Regulated ²
Battery	2.4	3	3.6	V	Unregulated
VDD Ext	2.4	-	5.5	V	Unregulated ³
Consumption	Min	Typ	Max	Unit	Comments
	-	-	100	mA	⁴

Table 1 Power sources specifications

Note: The input analog voltages are specified in the SX8723/24/25 datasheet.

¹ Can be regulated to 5.0, 3.3 and 2.4 V

² Can be regulated to 3.3 and 2.4 Volts

³ When jumper EXT_POW is connected

⁴ Max current, all LEDS on 5.5V, SX8723/24 full speed, GUI connected.

3.4 XE8000EV121 board overview

The picture below describes the main zones and functions accessible on the XE8000EV121

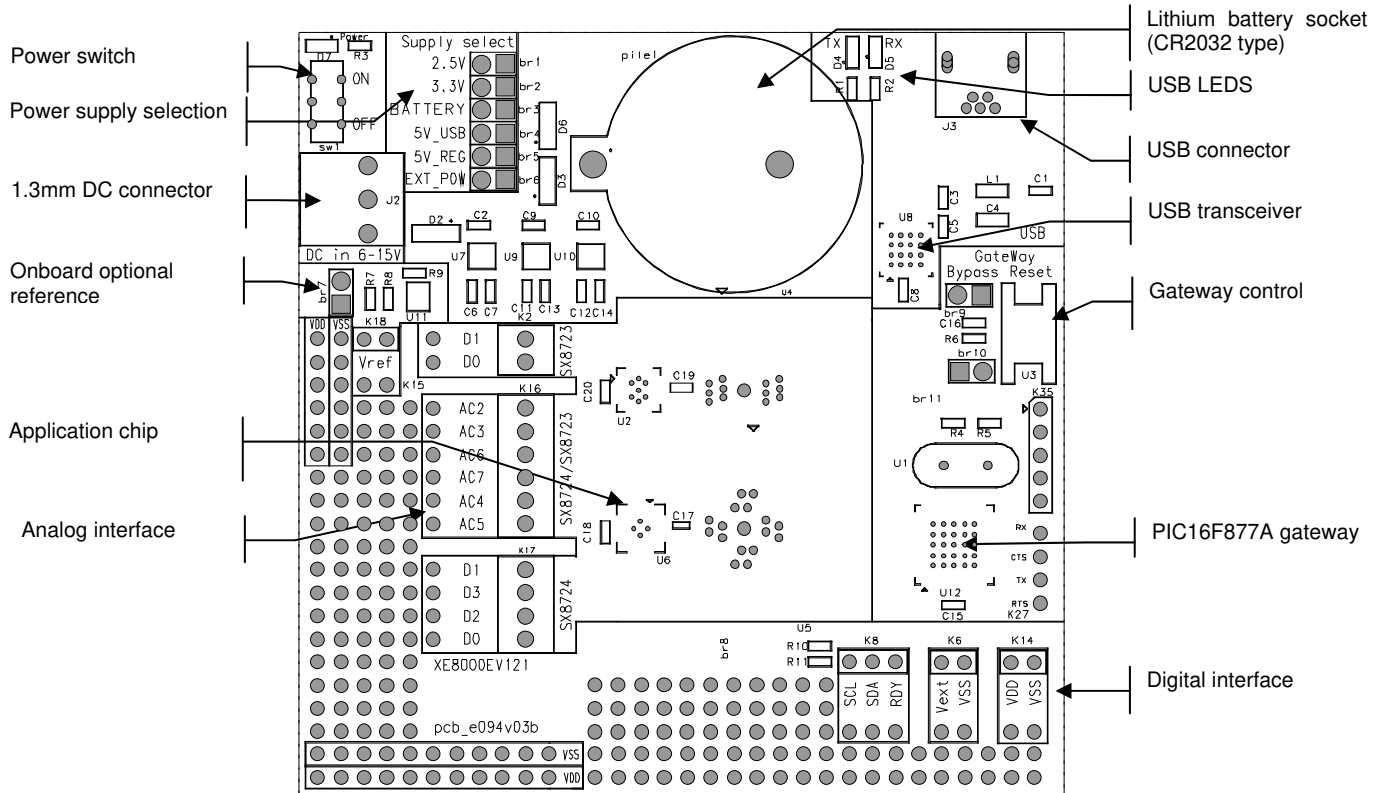


Figure 7 XE8000EV121 board overview

3.4.1 Power supply

The XE8000EV121 board provides a lot power supply voltage possibilities; the following paragraphs describe how to configure and use them.

3.4.1.1 Power sources

The board can be powered through four different power sources:

1. USB: USB power coming from the PC.
2. 1.3mm DC: Connection using a male 1.3mm DC connector⁵
3. Battery: 3.0VDC Lithium battery (CR2032 type)
4. VExt: External source applied on VDD_EXT pin of the digital interface (see § 3.5.2)

⁵ Reference example: Manufacturer: Cliff Electronic Components PN: DCP3
V1.7 © 2008 Semtech Corp.

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3.4.1.2 Power supply selection

Available supply voltages versus selected power source are described below:

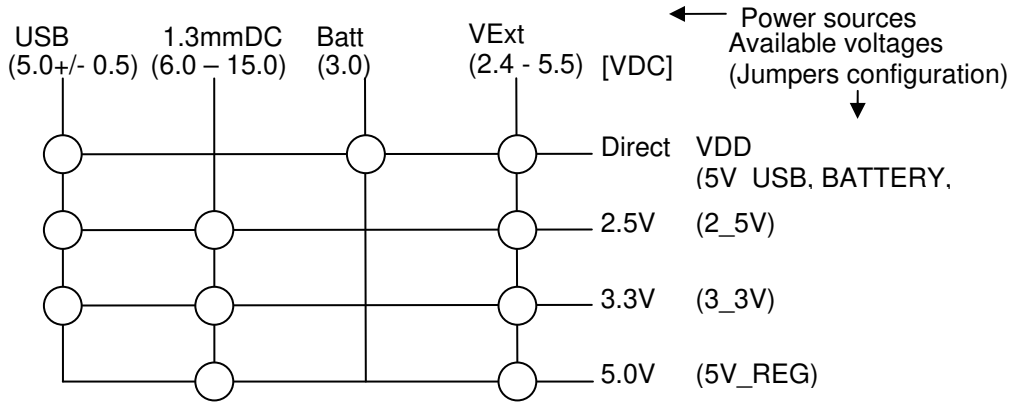


Figure 8 Power supply matrix

IMPORTANT: DO NEVER CONNECT EXT_POW JUMPER IF VDD_EXT IS HIGHER THAN 5.5VDC

The picture below shows the selector. User should place the jumper on the desired SX8723/24/25 supply voltage value.

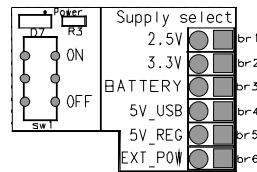


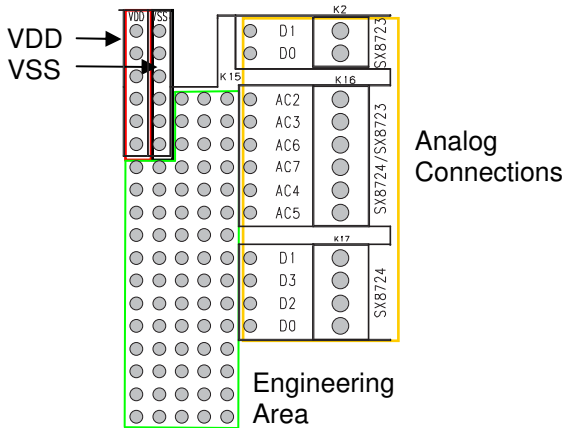
Figure 9 XE8000EV121 power supply selector

Note: Use only one jumper at the same time on the power supply selector.

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3.5 User interface

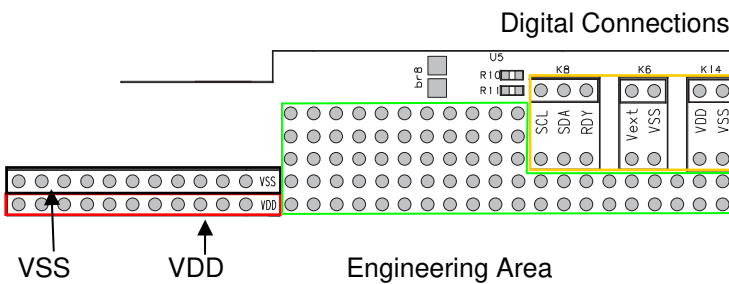
3.5.1 Analog interface



The analog interface gives access to the SX8723/24/25 analog pins.

The connections points are available on industrial PCB terminal blocks and on the bare PCB next to the engineering area.

3.5.2 Digital interface

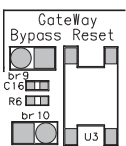


The digital interface gives access to the SX8723/24/25 digital pins, the PC gateway connections and the power supplies.

The connections are available on single row 2.54mm connectors and on the bare PCB next to the engineering area.

Using the engineering area, one can set its own application only using the SX8723/24/25 and bypassing the onboard gateway.

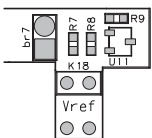
3.5.3 Gateway control



The gateway bypass (br9) jumper allows the user to bypass the onboard PIC16F877A. One can then set its own solution using the digital interface pins SDA&SCL (see §3.5.2). By default, the jumper is not connected.

The "Reset" button allows the user to reset the gateway.

3.5.4 Onboard optional reference



When connected the br7 jumper powers the onboard optional reference which is then present on the analog interface.

The reference chip is a Semtech SC431 shunt regulator adjustable from 2.5 to 5.5VDC. It is configured to provide a reference voltage of 2.5V. To set other voltages, please refer to SC431 datasheet and adjust the reference with R8 & R9 resistors.

4 SX87xx Evaluation Tools Graphical user Interface (GUI)

The GUI enables the user to interact with the XE8000EV121 and the Application board.

4.1 Overview

The GUI gives a complete overview of the current SX8723/24/25 configuration plus the ability to control it. The GUI is mainly divided in 4 sections:

1. Menu and Tool bar.
2. Commands.
3. SX8723/24/25 Registers.
4. Status bar

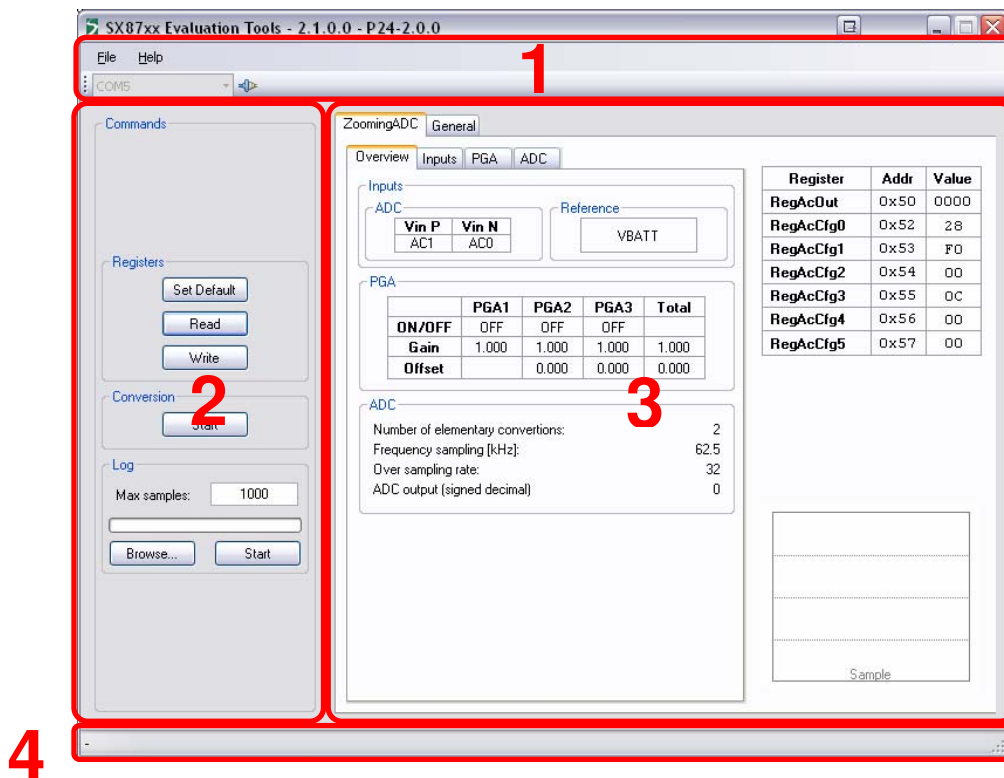


Figure 10 GUI Startup window

4.1.1 Menu and Tool bar (1)

The GUI menu is composed of 2 items:

1. The File menu gives the possibility to exit the application.
2. The Help menu gives the possibility to show the application "About box".

The GUI Toolbar is composed of 2 items:

1. A "Combo box" that lists the available Serial COM ports on the PC.
2. A button that opens or closes the Serial COM port selected in the "Combo box".

4.1.2 Commands (2)

The Commands section is composed of 3 items that enables the user to control the SX8723/24/25:

1. Registers
 - a. Set Default button will write the default values to the SX8723/24/25 as stated in the corresponding datasheet.
 - b. Read button will read all the SX8723/24/25 registers and update the section 3 of the GUI.
 - c. Write button will write all the values from the section 3 to the SX8723/24/25.
2. Conversion
 - a. If the ZoomingADC is set in single mode conversion the start button will be enabled. Each time you press this button a conversion is started.
3. Log
 - a. Max Samples input box indicates how many ZoomingADC samples are stored in the log file.
 - b. Browse button let the user choose where to store the log file and which name it will have.
 - c. Start button starts the logging process. While the logging process is running a progress bar will show the progress.

4.1.3 SX8723/24/25 Registers (3)

The SX8723/24/25 Registers section is composed of 2 tab pages that enable the user to modify or read the actual SX8723/24/25 settings.

The ZoomingADC tab enables the user to see the ZoomingADC registers detailed by function and also the corresponding hexadecimal registers value.

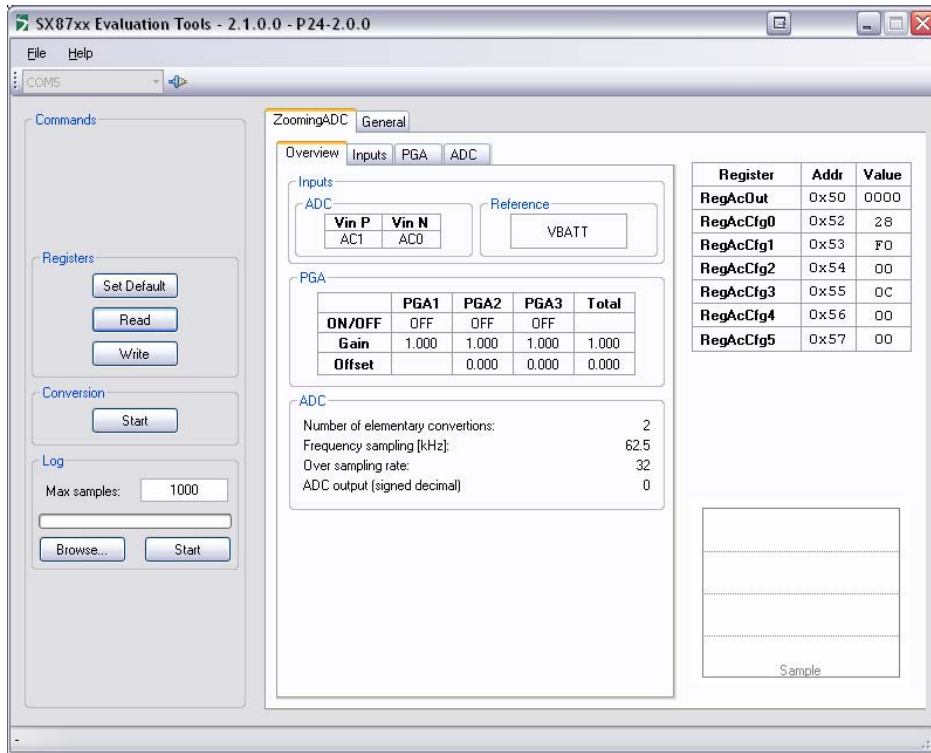


Figure 11 SX8723/24/25 ZoomingADC Tab

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The sub tab named “Overview” gives an indication of the configuration current settings for the ZoomingADC. This tab is read-only.

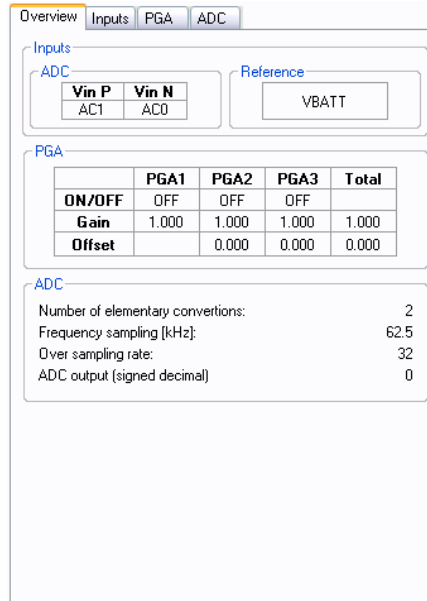


Figure 12 "Overview" sub tab

The sub tab named “Inputs” lets the user choose which inputs and which reference pins will be used to make the measurement. On this sub tab the user may also choose if the inputs are “Single-ended” or “Differential” as well as choosing which of the inputs is used as “Positive” or “Negative” input.

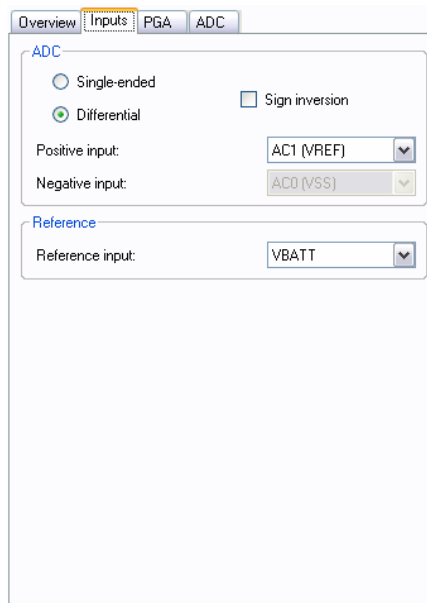


Figure 13 "Inputs" sub tab

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The sub tab named "PGA" lets the user control the gain, offset and enabling disabling each PGA individually. The user has also the possibility to control the PGA's biasing.

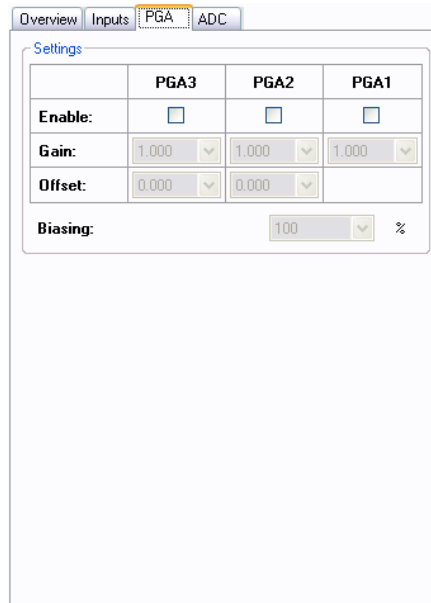


Figure 14 "PGA" sub tab

The sub tab named "ADC" lets the user control the ADC parameters. Parameters like number of elementary conversions, the oversampling rate, the sampling frequency and the ADC biasing can be tuned.

The user has also the possibility to decide if the ADC will work in one shot or in continuous mode.

When the Read button is pressed the last ADC converted value is also displayed in this sub tab.

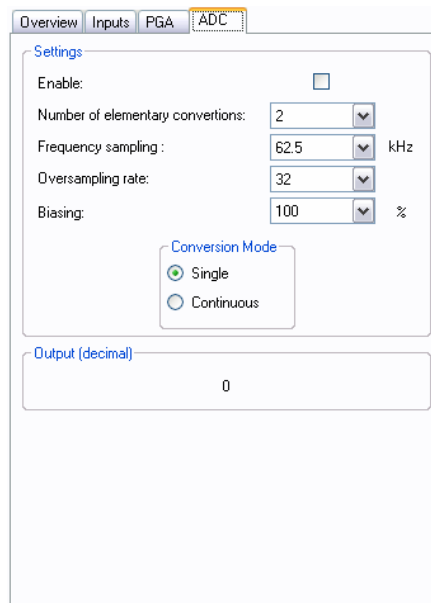


Figure 15 "ADC" sub tab

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The ZoomingADC tab has a graphic representing the ADC output. The graphic is in auto-scale mode.

If the user double-clicks on the graphic it will expand until it fills the whole ZoomingADC tab space. (See Figure bellow).

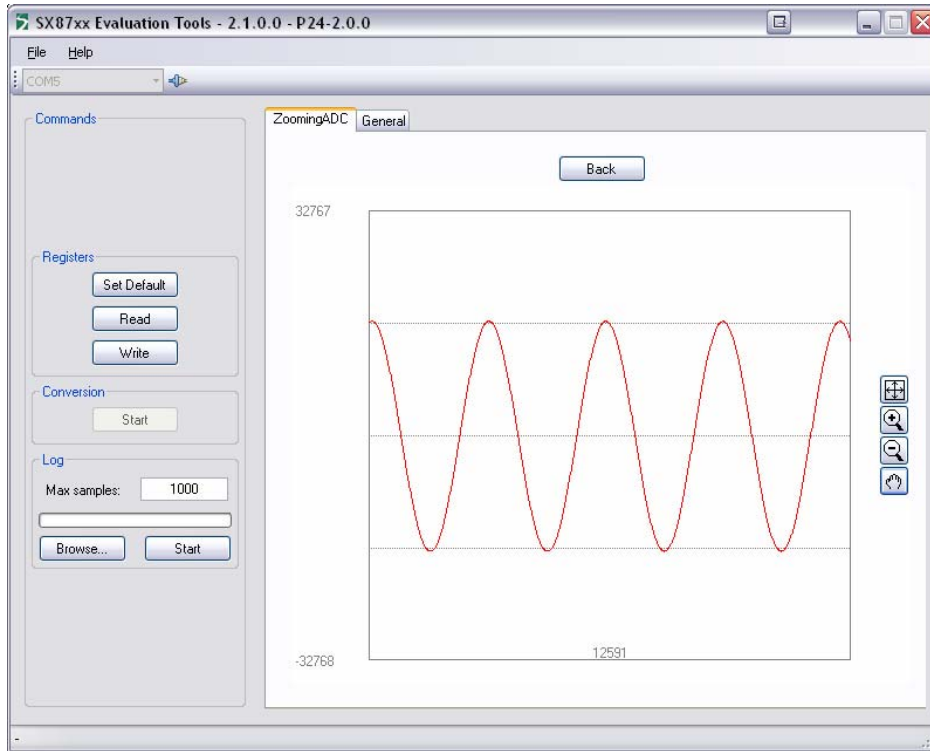




Figure 16 Expanded ADC graphic

The “Back” button will reduce the graphic and will show again the ZoomingADC configuration.

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The 4 small buttons on the Graphic give the user the possibility to:

1.  Performs an auto scale of the graphic. If the button is double-clicked the auto scale is permanent until one of the buttons is pressed again.
2.  Zoom +, If the user draws a rectangle in the graphic and then release the mouse button the graphic will zoom the signal inside the rectangle.

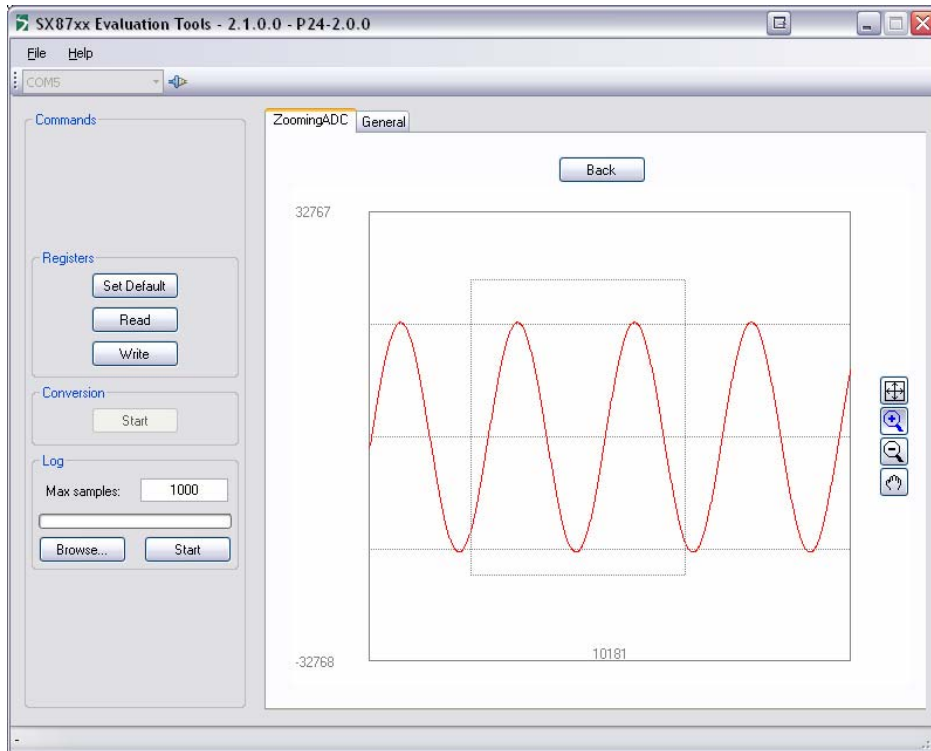


Figure 17 Zoom +

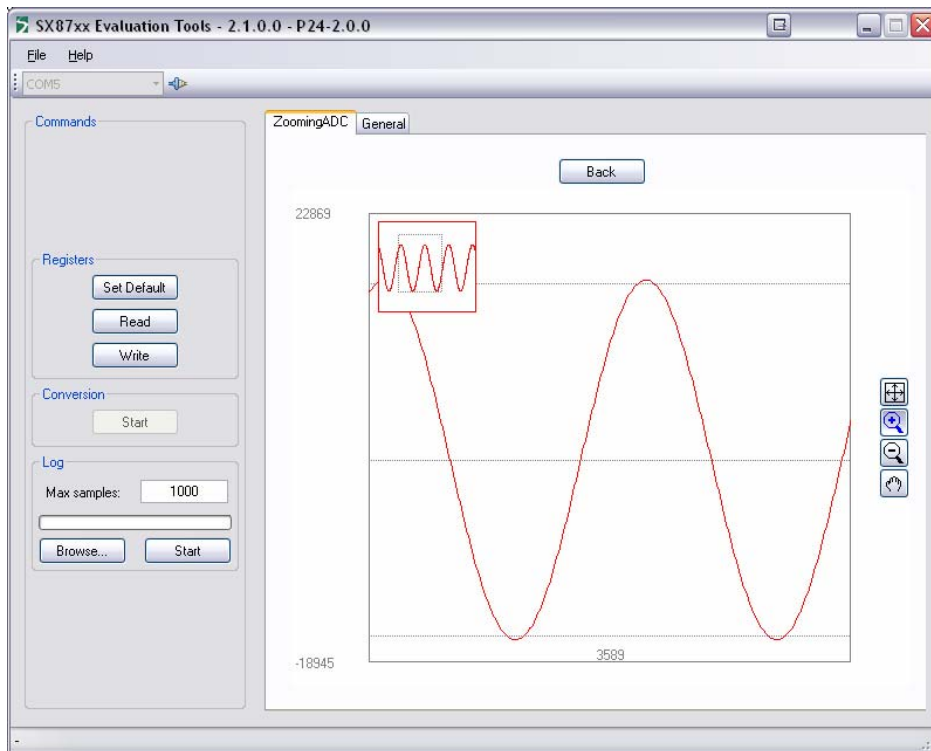



Figure 18 After zoom +

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3.  Zoom -, Once the button is selected each time the user clicks on the graphic it will zoom out.

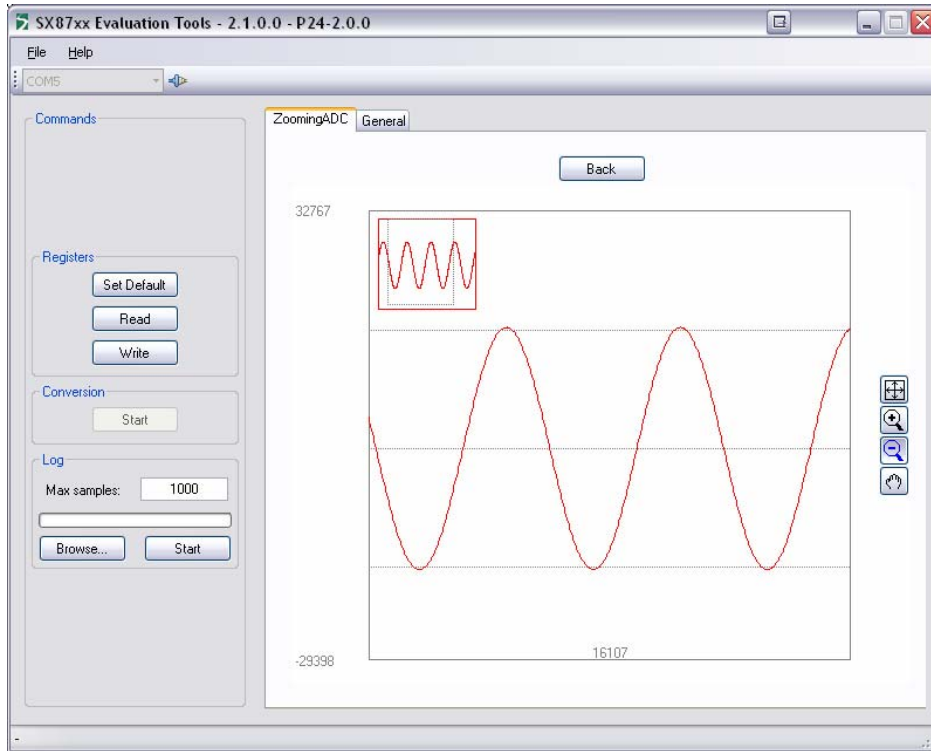



Figure 19 After Zoom -

4.  Move the zoomed window. To move the zoomed window the user must select the corresponding button and then click on the graphic without releasing the button and move the mouse.

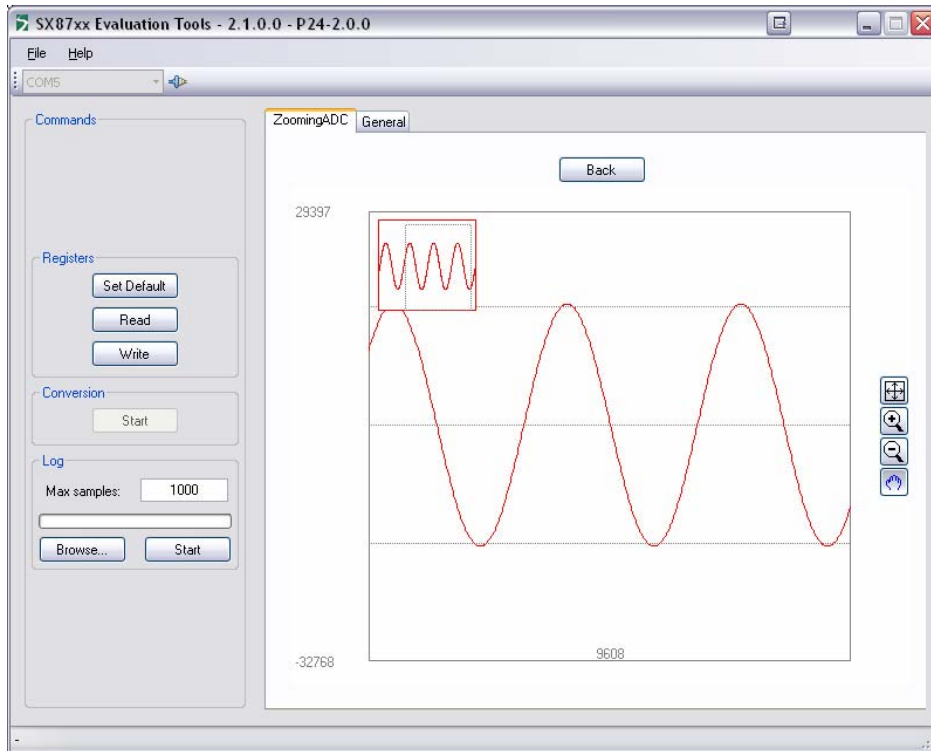


Figure 20 After the graphic has been moved

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The tab named “General” gives access to the SX8723/24/25 non ZoomingADC features. The user can control the GPIO pins as well as configuring the Mode register. The user can also see the SX723/24 graphic of the ZoomingADC.

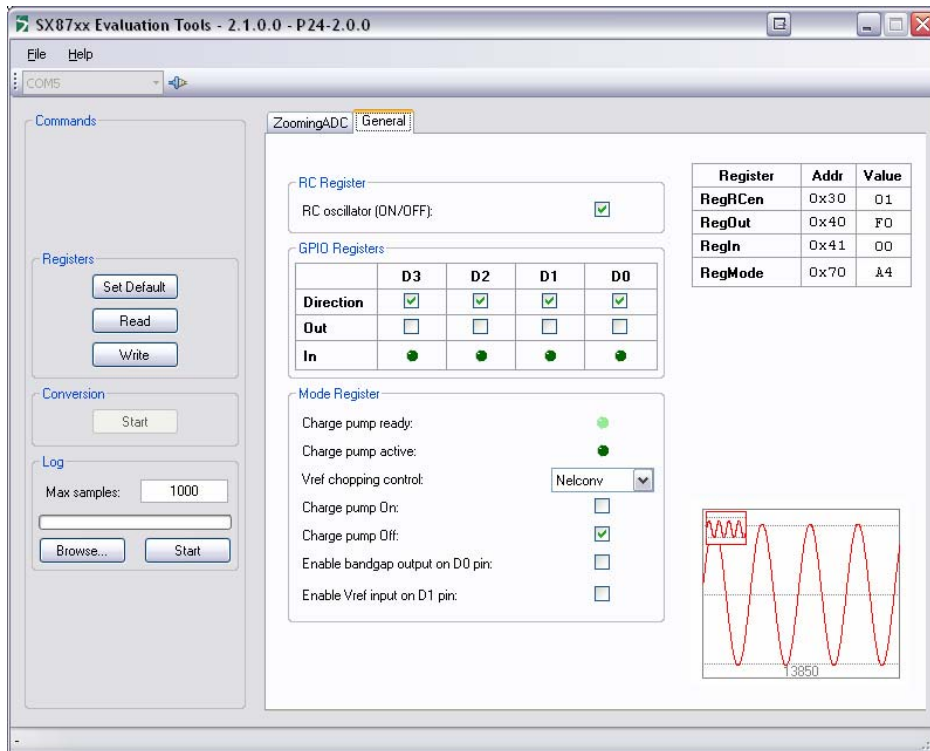


Figure 21 SX8723/24/25 Registers General Tab

4.1.4 Status bar (4)

The Status bar will display application errors that may happen while using the GUI. If there is no error the status bar shows a “-“sign.

5 Troubleshooting

The SX87xx Evaluation tools software has some known issues. These are:

1. If Palm HotSync tool is running the GUI doesn't start correctly.
Solution: When using the SX87xx tools please disable the HotSync application.
2. If the user disconnects the USB cable or shuts down the Evaluation board a Windows error message may appear when the GUI is closed or the user closes the Serial Port.
Solution: None.

6 XE8000EV121 board

6.1 Schematics

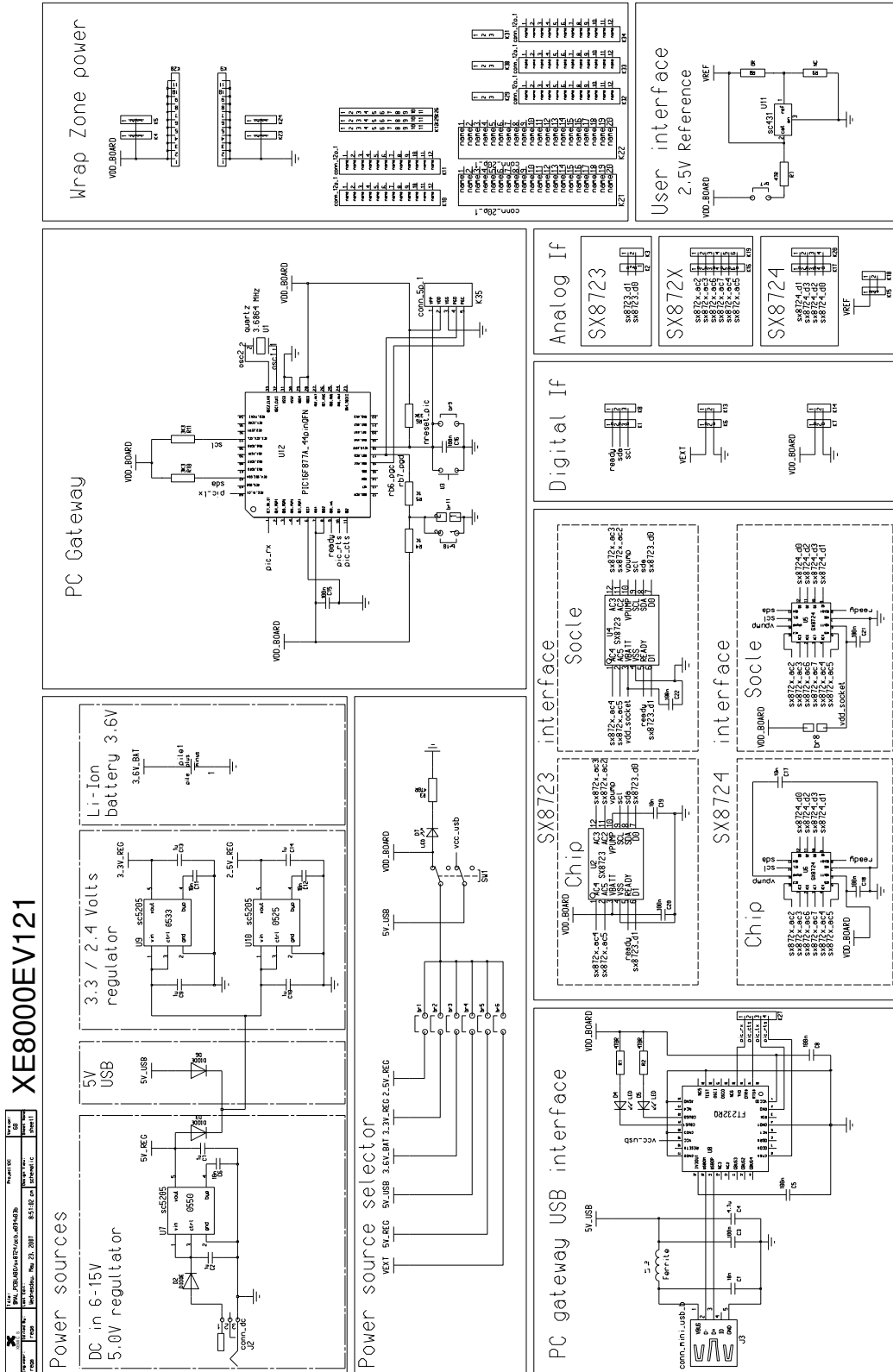


Figure 22 XE8000EV121 board schematic

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6.2 Physical dimensions

The XE8000EV121 is a 2 layers board.

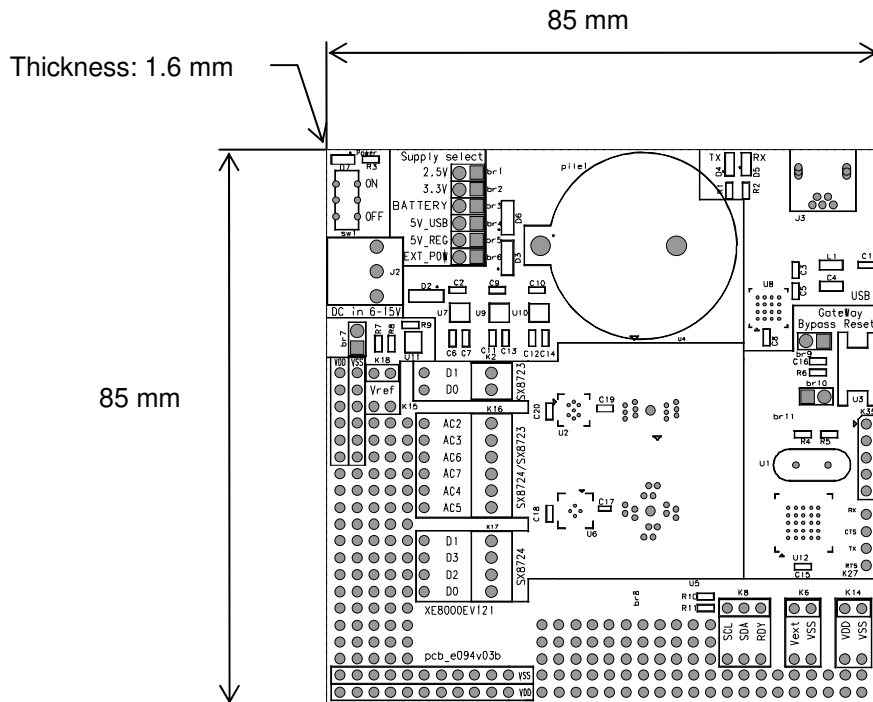


Figure 23 XE8000EV121 physical dimensions