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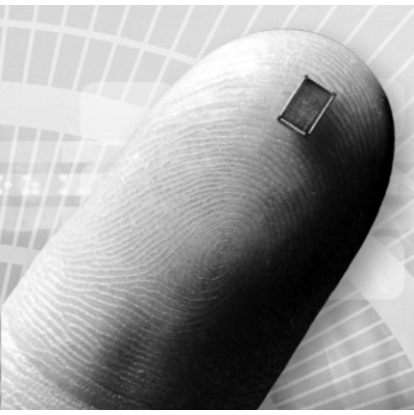

Q32M210 Engineering Tool Quick Start Guide

Beta Version

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ON Semiconductor
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To maintain the quality of our publications, we request your comments on the accuracy, clarity, organization, and value of this document.

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1 Introduction

The Q32M210 Engineering Tool is a Windows® application that allows the evaluation of the Q32M210 hardware in a Q32M210 Evaluation and Development Board.

1.1 How to Use this Quick Start Guide

This quick start guide is intended to be used with the Q32M210 documents shown below:

- Q32M210 Installation Guide
- Q32M210 Programmer's Guide
- Q32M210 Firmware Reference Manual
- Q32M210 Evaluation and Development Board Manual
- Q32M210 Data Sheet

1.2 Q32M210 Engineering Tool Overview

The following components are needed in order to install and operate the Q32M210 Engineering Tool.

- Q32M210 Evaluation and Development Board
- EngTool.msi install program
- Q32M210 Flash Loader
- Optional resistors or current source for calibration of PGA and ADC
- Optional resistive divider for Vref/2 voltage source

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2 Installation

2.1 Overview

There are two steps necessary to install the Q32M210 Engineering tool:

1) Windows executable program installation
2) Q32M210 Evaluation and Development Board kernel firmware installation

2.2 Windows Executable Program Installation

The Q32M210 Engineering Tool requires the .NET 4.0 Client Profile to be installed prior to installing the Engineering Tool.

The client profile is available from Microsoft at the following location:

http://www.microsoft.com/downloads/en/details.aspx?FamilyID=5765d7a8-7722-4888-a970-ac39b33fd8ab&displaylang=en

1) Download and run dotNetFx40_Client_setup.exe
2) Install the Windows executable by running EngTool-VERSION.msi.

2.3 Q32M210 Evaluation and Development Board Kernel Firmware Installation

The Engineering Tool requires the Q32M210 “Kernel" firmware image to be loaded on the Evaluation and Development Board. To install the kernel, install and run the Q32M210 Flash Loader application, which can be obtained from ON Semiconductor.

If the IAR programming environment is available, the image can also be loaded from within the IAR tools by creating an "Externally built executable" project and adding the Kernel.hex file from the directory specified below.

- Connect the USB cable to the DEBUG USB connector
- Launch the Q32M210 Flash Loader Application

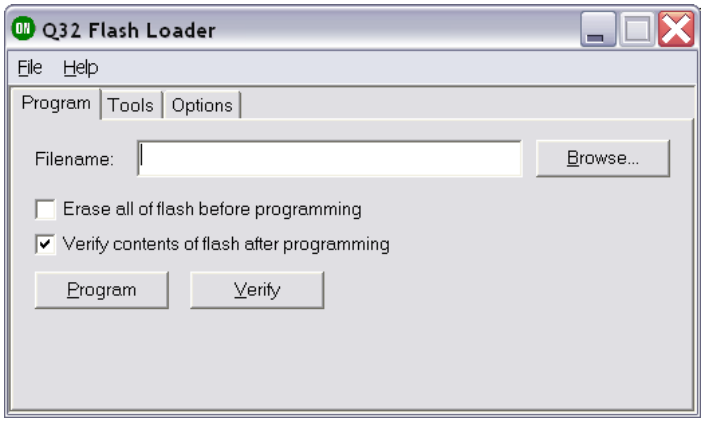

Figure 1 Flash Loader GUI

- Click "Browse" and select the firmware image.
- The firmware image is installed with the Engineering Tool and can be found at: C:\Program Files\ON Semiconductor\Q32M210 Engineering Tool\firmware\Kernel.hex
- Select "Program".
- Connect the USB cable to the USB connector.
- If power is provided to the board via the J1 external power connector (i.e. not via USB), reset the chip by pressing the RSTB button.
- Power cycle or reset the chip to start up the kernel application.

3 Q32M210 Graphical User Interface

3.1 Q32M210 Engineering Tool Top Menu

The common menu items for the Q32M210 Engineering Tool GUI are shown below.

Figure 2 Top Menu

The menu bar of the Q32M210 Engineering Tool contains the following menu selections:

3.1.1 File

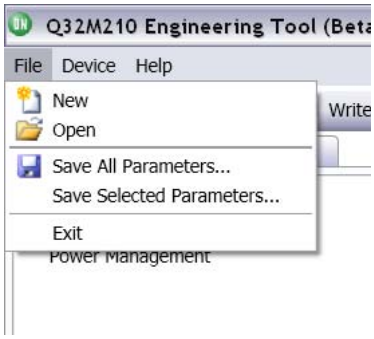

Figure 3 File Menu

This menu allows parameters to be saved and recalled from a file as shown in the figure above.

3.1.2 Device

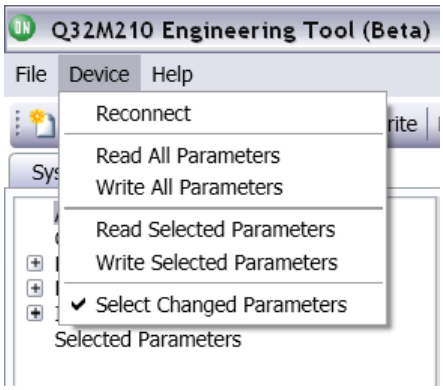

Figure 4 Device Menu

This menu provides multiple functions as described in the sections below.

3.1.3 Communication with Evaluation and Development Board

Reconnect

This command establishes, or re-establishes connection with the Evaluation and Development Board.

- Ensure that the USB cable is connected to the USB connector on the Evaluation and Development Board.
- Click the "Reconnect" button in the Device menu.

Read All Parameters

This command populates the “values” column in the Parameters tab with the contents of the Q32M210 memory registers.

Write All Parameters

This command writes to most parameters whether they are selected or not. Note that certain parameters (particularly those that can disrupt USB communications) are not written unless they are explicitly selected.

Reading and Writing Selected Parameters

Specific parameters may be read or written by checking the boxes next to the parameter names on the pages under the "Parameters" tab. These parameters may be read or written by clicking "Read Selected" or "Write Selected" respectively.

The list of currently selected parameters can be found on the "Selected Parameters" page under the "Parameters" tab and can be cleared by clicking the "Clear Selected" button. In most cases, it is most convenient to simply read and write all parameters.

3.1.4 Help

Figure 5 Help Menu

This selection provides the version information of the Q32M210 Engineering Tool.

3.2 Q32M210 ENGINEERING TOOL MAIN MENU TABS

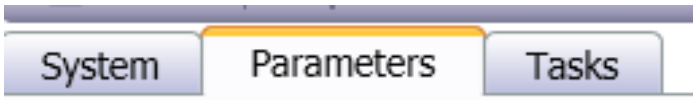

Figure 6 Main Menu Tabs

There are three main tabs in the main GUI of the Q32M210 Engineering Tool:

3.2.1 System

The sub-sections of this tab allow the configuration of opamps, PGA's, D/A converters, power management of the Q32M210. The parameters displayed in this tab are an alternate view of the parameters available on the "Parameters" tab, described below.

The "Parameters" tab includes the complete set of parameters associated with each block, while the "System" tab displays the most commonly used subset.

Parameter values are entered and displayed in decimal value in the System tab. In order to send the updated parameter values to the Evaluation and Development Board when using the System subsection menus, click anywhere outside of the parameter box and then select "write " in the top menu to effect the changed of value.

3.2.2 Parameters

Parameter values of the Q32M210 subsystems can be examined and modified in this section of the GUI.

Please refer to the Q32M210 Hardware Reference Manual for detailed information on the contents of the individual registers.

3.2.3 Tasks

The Tasks tab contains three main applications for key Q32M210 functions

- Configure Clocking
- ADC Capture

- TIA Calibration

A description of these tabs is provided in the sections below.

3.2.3.1 Configure Clocking

This section provides information and configuration options for the Q32M210 MCLK and ADC Sampling rate. The MCLK clock domain is the main clock domain divided from RCLK, which is the primary root clock.

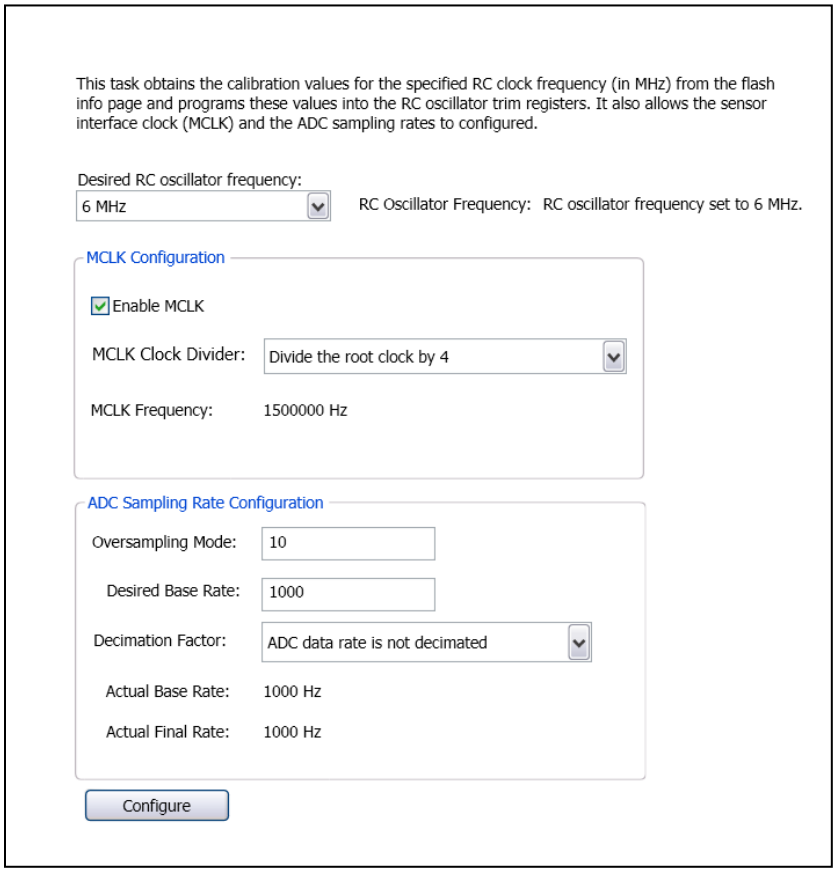

Figure 7 MCLK and ADC

Before using the sensor interface, it is necessary to set a calibrated oscillator frequency.

The oscillator frequency can be easily configured as described below:

- Ensure “Enable MCLK” is selected
- Select the desired frequency in the drop down menu
- Click "Configure"

3.2.3.2 ADC Capture

This task allows the user to enter in a specific number of samples to be captured by any combination of ADC channels, and display a statistical representation of the data in the GUI.

The task also provides options for triggering with a switch on the Evaluation and Development Board and for copying the collected data samples onto the Windows clipboard. The data can then be pasted into another application, such as Microsoft Excel.

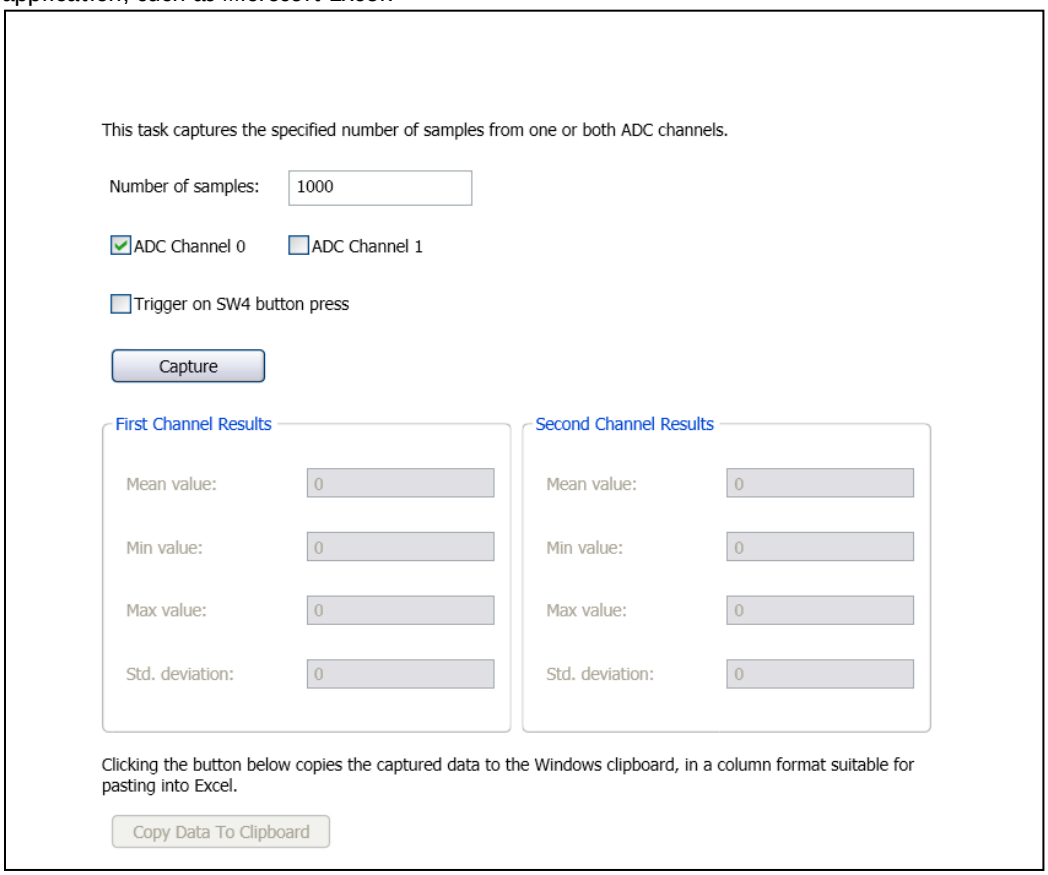

Figure 8 ADC Capture Menu

3.2.3.3 Transimpedance Amplifier (TIA) Calibration

This task allows a user to calibrate and evaluate the performance of a transimpedance amplifier based on the analog front end and A/D hardware of the Q32M210.

The TIA calibration interface is shown in the diagram below.

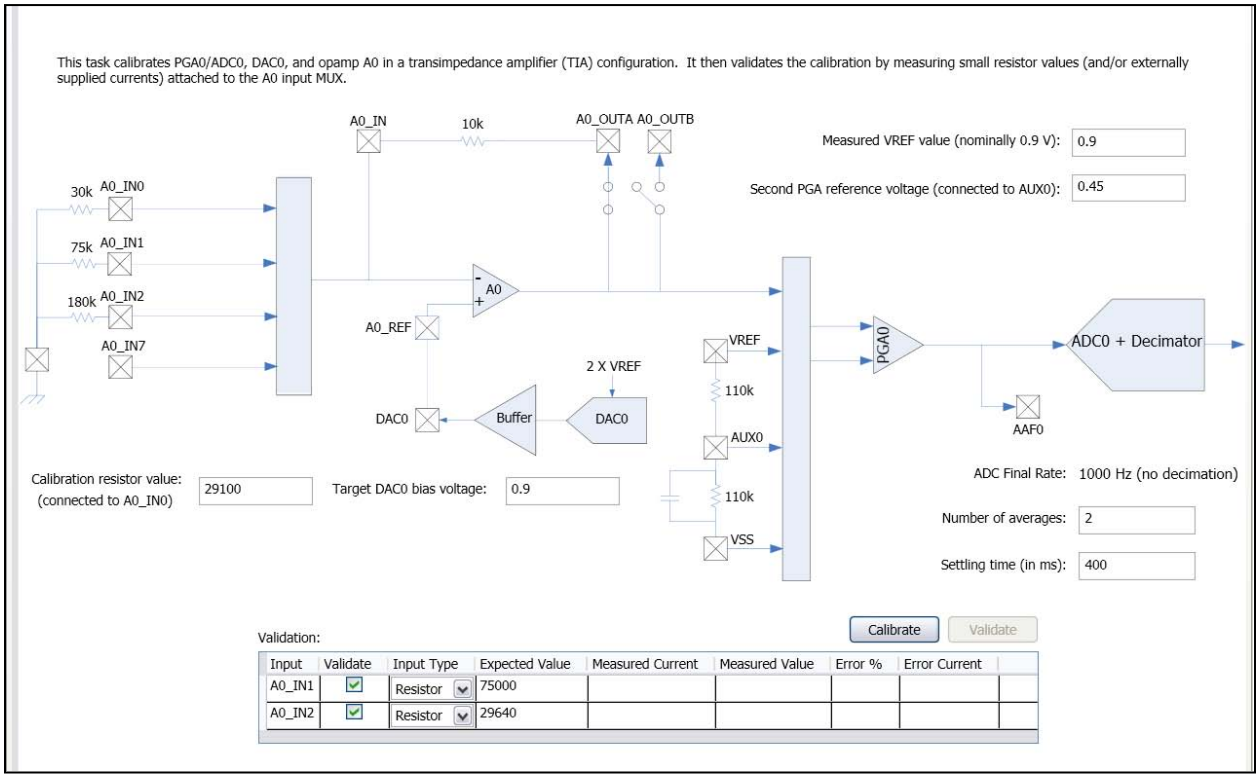

Figure 9 Transimpedance Amplifier(TIA) Calibration Menu

Applications such as blood glucose monitoring and temperature measurement require the Q32M210 microcontroller to measure and display an input current in terms of output voltage. This current to voltage translation can be provided by a transimpedance (TIA), and is shown in the diagram below.

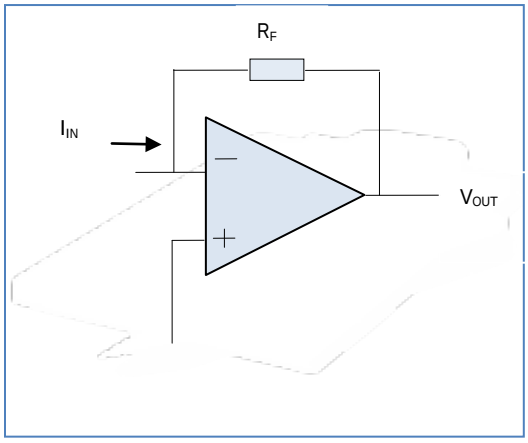

Figure 10 Transimpedance Amplifier (TIA)

By referring to the GUI, it can be seen that the Q32M210 opamp A0 (labeled AMP0 on the Evaluation and Development Board) is used for this application.

3.3 CONFIGURING THE Q32M210 EVALUATION AND DEVELOPMENT BOARD

Please refer to ON Semiconductor Document number M-20693-002 *"Evaluation and Development Board Manual"* for detailed information on the Q32M210 EDK.

The layout of the board is shown below for reference.

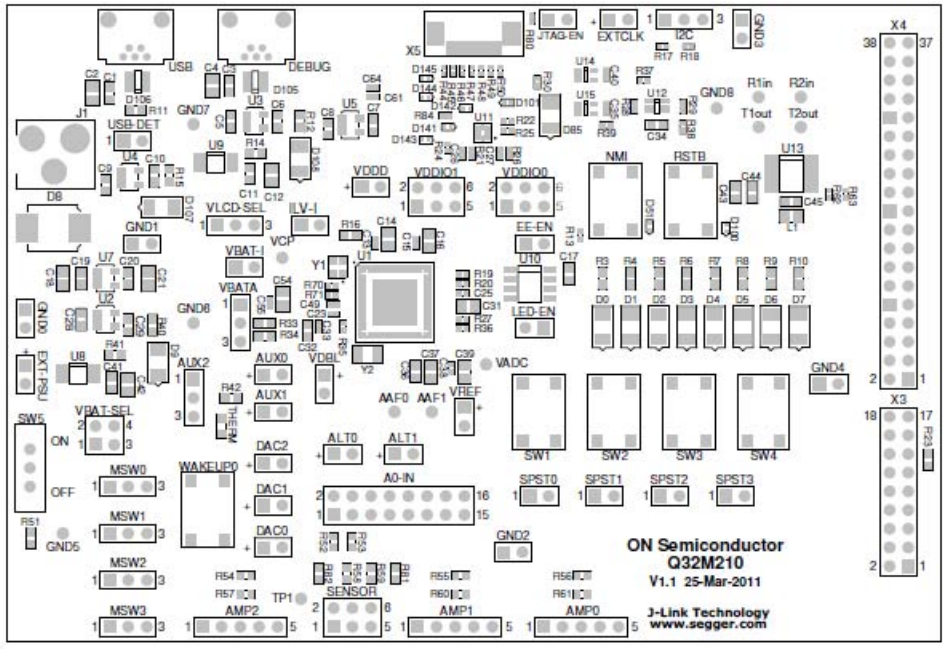

Figure 11 Evaluation and Development Board Layout

The following modifications to the EDK hardware are required in order to implement a transimpedance amplifier for use with the TIA calibration tool.

1) Create a voltage reference of Vref/2 for PGA0. This can be accomplished with a resistive voltage divider network connected between Vref and ground. Connect Vref/2 to the AUX0 input (pin 1, labelled "+").

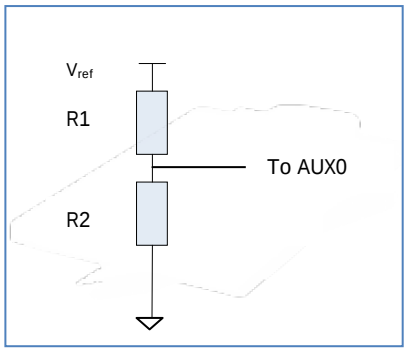

Figure 12 Resistor Divider

2) Connect a wire from the DAC 0 output header (pin 1, labelled "+") to the AUX0 input located on header AMP0 pin2

3) Populate R61 with a 10K R_f resistor

4) Connect a known reference resistor between pins 1 and 2 of the A0-IN header.

5) Connect two known validation resistors between pins 3-4 and 5-6 respectively on header A0-IN.

3.3.1 GUI Operation

- With the reference and measurement resistors in place, ensure that the Evaluation and Development Board is powered and connected to the host PC.
- Enter the value of the calibration resistor in the Calibration Resistor Value Box
- Enter the value of the validation resistors in the Calibration Resistor Value Box
- Press the Calibrate button to calibrate the gain and offset of the PGA and ADC.
- Press the Validate button to measure the value of the validation resistors

3.3.2 Limitations on Resistance Measurement

The choice of a 10K resistor for the R_f resistor in the TIA will limit the maximum current, and minimum resistance that can be measured with this application.

With a 10K resistor, the measurement error will increase as the validation resistor value decreases towards 10K. For greatest accuracy, use a validation resistor value greater than 15K.

Also, as the validation resistor value increases and input current values decrease, input referred noise and residual offset will become a significant source of error.

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